

EN Assembly Instructions
Electric cylinder LD1000E

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1 Installation Declaration

1.1 LD1000E Installation Declaration

within the meaning of the Machinery Directive 2006/42/EC, Annex II, 1.B for incomplete machines

Manufacturer:

Phoenix Mecano Solutions AG

Hofwisenstrasse 6
CH-8260 Stein am Rhein

confirms that the product named therein

Product designation: *LD1000E*
Type designation: *LD1000E*
Trade name: *LD1000E*
Function: *Electromotive extension and retraction of the pushrod for creation of linear motion*

meets the requirements for an **incomplete machine** according to the Machinery Directive 2006/42/EC.

The following essential requirements of the Machinery Directive 2006/42/EC according to Annex I have been applied and fulfilled:

1.1.5.; 1.3.2.; 1.3.3.; 1.3.4.; 1.3.7.; 1.5.1.; 4.1.2.1.; 4.1.2.3.

It is also declared herewith that the special technical documentation according to Annex VII Part B has been compiled.

It is expressly stated that the **incomplete machine** complies with all applicable provisions of the following EC guidelines:

2011/65/EU Directive 2011/65/EU of the European Parliament and the Council dd. 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

IEC 60601-1-2:2014 Medical Electrical Equipment – Part 1-2: General requirements for basic safety and Essential performance – Collateral standard: Electromagnetic disturbances – Requirements and test (IEC 60601-1-2:2014); German version EN 60601-1-2:2015

Phoenix Mecano Solutions AG undertakes to submit technical documentation for the incomplete machine upon substantiated request of the national competent bodies in electronic format.

A person established within the Community and authorised to draw up the relevant technical documentation:

Timo Fluck

Phoenix Mecano Solutions AG
Hofwisenstrasse 6
CH-8260 Stein am Rhein

Setting into operation is forbidden until it is established that the machine, into which this incomplete machine is installed, complies with the provisions of the EC Directive 2006/42/EC.

It must comply with the CE guidelines prior to marketing, including with regard to documentation.

Stein am Rhein / 18.06.2019

Mechanical components
(place/date)



(signature)

Timo Fluck
Technical supervision

(identification of the signatory)

2 General information

2.1 Notes on these assembly instructions

These assembly instructions are only applicable for the electric cylinder described and intended as documentation for the manufacturer of the final product, into which this incomplete machine will be installed.

We herewith particularly emphasize that the operating instruction containing description of all functions and safety notes for the final product must be compiled for the end customer by the manufacturer of the final product.

This also applies to the installation into a machine. The machine manufacturer is responsible for the respective safety equipment, inspections, documentation and monitoring of pinch and shear points that may potentially arise.

This assembly instructions help

- avoid hazards
- and downtime,
- and guarantee and / or extend the lifetime of the product.

Hazard warnings, safety recommendations and data in these assembly instructions shall be adhered to with no exception.

The assembly instructions must be read and used by each person, who works with the product.

Setting into operation is forbidden until it is established that the machine complies with the provisions of the EC Guidelines 2006/42/EC (Machinery Directive). It must comply with the CE guidelines prior to marketing, including with regard to documentation.

We expressly draw the attention of the re-user of this incomplete machine / partial machine / machine part to the duty of extension and complementation of this documentation. In particular, a CE Declaration of Conformity must be drawn up by the re-user in case of fitting or mounting of electric elements and/or drives.

Our Installation Declaration will automatically become void.

3 Liability / warranty

3.1 Liability

Phoenix Mecano Solutions AG assumes no liability for damages or impairments resulting from structural modifications by a third party or modifications of the safety devices of this electric cylinder.

Phoenix Mecano Solutions AG assumes no responsibility for the spare parts that have not been tested and authorised by Phoenix Mecano Solutions AG.

Otherwise, the EC Installation Declaration becomes void.

The safety-related devices must be regularly tested for operability, damage and integrity.

We reserve the right to make technical modifications of the electric cylinder and changes of its assembly instructions.

Advertising materials, product leaflets on sales activities, public statements or similar notices may not be taken as basis for suitability and quality of the product, for which purpose a detailed technical advice is strongly recommended. No claims can be asserted against Phoenix Mecano Solutions AG as to availability of previous versions or adjustments to the current version of the electric cylinder.

In case of any inquiries please specify the type plate data.

Our address:

Phoenix Mecano Solutions AG
Hofwisenstrasse 6
CH-8260 Stein am Rhein

Tel.: +41 (0)52 742 75 00

Fax: +41 (0)52 742 75 90

3.2 Product monitoring

Phoenix Mecano Solutions AG offers products with highest possible technical level, adapted to the latest safety standards. Inform us please immediately of any recurrent failures or malfunctions.

3.3 Language of the operating instructions

The original version of these assembly instructions was drawn up in the EU official language of the manufacturer of this incomplete machine. Translations into other languages are translations of the original version subject to the legal requirements of the machinery directive.

3.4 Copyright

Individual copies, e.g. copies and printouts, may only be made for private use. Production and dissemination of other reproductions is only permitted with the express consent of Phoenix Mecano Solutions AG. Users themselves are responsible for compliance with legal regulations and can be held liable in the event of misuse. The copyright owner of these assembly instructions is Phoenix Mecano Solutions AG.

4 Use / operating personnel

4.1 Intended use

The electric cylinder shall be used exclusively for the adjustment of the guided components or other comparable adjustment tasks. The electric cylinder may not be used in potentially explosive atmosphere as well as in direct contact with food, pharmaceutical or cosmetic products. Catalogue information, content of these assembly instructions and / or conditions specified in the order must be taken into account. The values specified in these assembly instructions are maximum values and may not be exceeded.

4.2 Unintended use

“Unintended use” means that the information given in section 4.1 *Intended use* is not being observed. Unintended use and improper handling, as well as operating, installing or handling this electric cylinder by untrained personnel may result in hazards to the personnel. Moving persons with this electric cylinder, for example, is an example of an unintended use and is forbidden. Phoenix Mecano Solutions AG is released of liability and general operating licence of this electric cylinder becomes void in case of unintended use.

4.3 Reasonably foreseeable misuse

- Overloading the device by exceeding the weight or duty cycle
- Use in the environments outside the specified IP protection class
- Use in the environment with high humidity > dew point
- Use in the premises with potentially explosive atmosphere as defined in ATEX Directive
- Operating in damage to the mains supply, housing, motor cable, manual switch or other control lines (SPS, PC, etc.) →
Attention: Accessories (power supply, manual switch, etc.) have protection class IP40
- Use when incompletely assembled or insufficiently fixed
- Stroking out (moving up to a stop)
- Use in applications with lateral forces and torques

When unplugged, no hazard may arise.

4.4 Who may use, install and operate this electric cylinder?

Individuals, who have fully read and understood the assembly instructions, may use, install and operate this electric cylinder. The responsibilities associated with handling this electric cylinder must be clearly defined and observed.

5 Safety

5.1 Safety instructions

Phoenix Mecano Solutions AG has constructed this electric cylinder according to the current state of the art and existing safety regulations. However, if the electric cylinder is misused and/or operated in the manner inconsistent with the intended use or if the safety instructions are not observed, this may result in hazards to personnel and property. Competent handling guarantees high performance and availability of the electric cylinder. Faults or conditions, which may impair the safety, must be rectified immediately.

Every person involved in the assembly, use or operation of this electric cylinder, must have read and understood the assembly instructions.

This includes:

- understanding the safety instructions in the text, and
- being familiar with the configuration and functioning of various options of operation and application.

The electric cylinder may only be used, installed and operated by the designated, trained personnel. Any works on and with the electric cylinder may only be carried out according to this instruction. This instruction needs therefore be kept safe and close at hand in the vicinity of the electric cylinder.

The general, national or operational safety instructions shall be observed. Responsibilities for the use, installation and operation of this electric cylinder must be unequivocally stipulated and observed so that no unclear situation may arise with regard to safety aspects. Before every commissioning, the user must ensure that no persons or objects remain in the danger area of the electric cylinder. The user may only operate the electric cylinder if it is in a faultless condition. Any change must be immediately reported to the nearest person responsible.

5.2 Special safety instructions

- Any works with the electric cylinder may only be carried out according to this instruction.
- The device may only be opened (installed / dismantled) by authorised specialist personnel. In case of any defect of the electric cylinder, we recommend to contact the manufacturer and/or send this electric cylinder for repair.
- Power supply must be disconnected before installation, dismantling, maintenance or troubleshooting.
- The re-user must prevent pinching between guiding tube and the front suspension by means of design.
- A proper installation of the supply lines prevents the hazards posed by this application.
- Only use original accessories and spare parts.
- The re-user must prevent potential damages caused by the failure of the end position switch-off or nut breakage by means of design.
- The electric cylinder may not be exposed to lateral forces or torques exceeding the specified values.
- Loss of connection between the thrust rod and guiding tube in case of a tensile load must be prevented by means of design. It means that, especially with suspended loads, additional safety devices (e.g.: cable, chain, etc.) must be affixed!
- During maintenance, only original parts must be used and installed by trained specialist personnel.
- For safety reasons, unauthorised modifications or changes of the electric cylinder are prohibited.
- The performance data of this electric cylinder determined by Phoenix Mecano Solutions AG may not be exceeded (see 6.6 *Performance diagram*).
- The type plate must remain legible. The data must be retrievable without effort at any time.
- Safety-relevant hazard signs identify danger areas on the product.
- Safety-relevant devices must be tested for operability, damage and integrity on a regular basis, at least once a year.
- In case of an overhead installation of the electric cylinder, the fastened loads must be secured onsite against dropping. The danger area under the application must be marked in the documentation of the final product.
- The electric cylinder must immediately be put out of operation if the mains cable and/or supply line is damaged.

5.3 Safety signs

These warning and mandatory actions signs are the safety symbols which warn of risk or hazard.

Data of these assembly instructions regarding special hazards or situations with electric cylinder must be complied with, while non-observance increases the risk of an accident.



The "General mandatory action sign" indicates the necessity to exercise caution.

Data marked with this sign in these assembly instructions require your particular attention.

These contain important information on functions, settings and procedures.

Failure to observe may lead to personal injuries, disturbances of the electric cylinder or the environment.

6 Product information

6.1 Mode of operation

The electric cylinder serves for adjustment of the guided components or other similar adjustment tasks. It is driven by a low voltage motor.

6.1.1 Variants of power supply

Power supply 12 / 24 / *48 VDC

6.1.2 Variants of force / speed

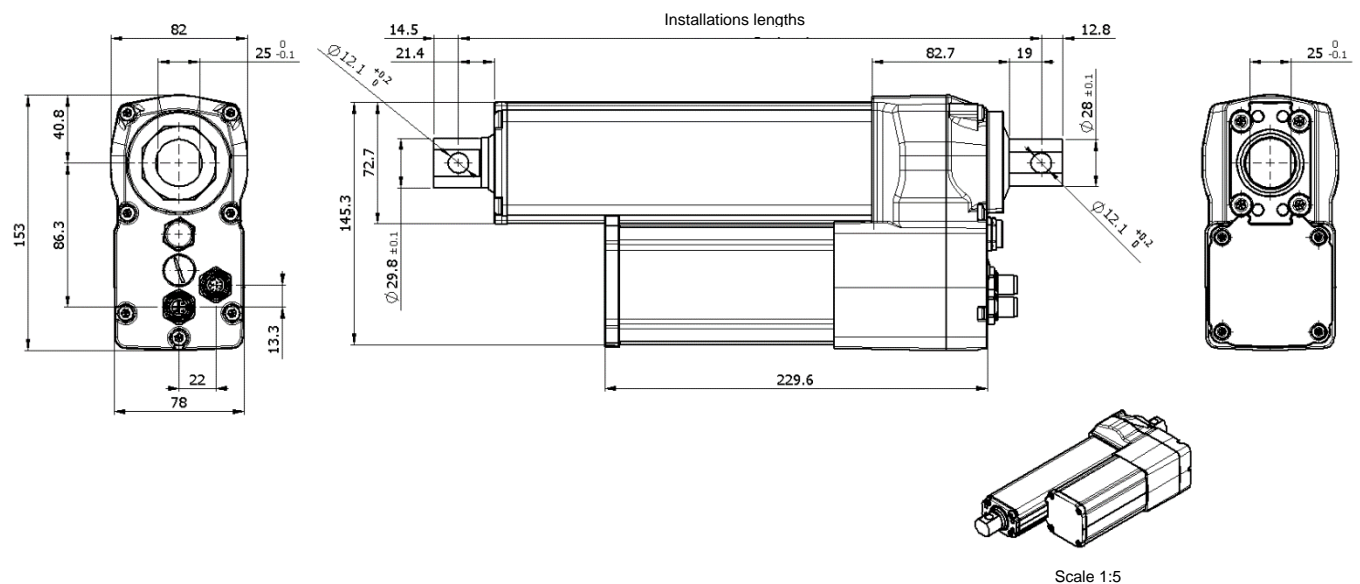
There are the following basic configurations in terms of force / travel speed of the electric cylinder LD1000E (see also 6.7):

Versions	Push force	Pull force	ES variant	
			No-load (@24VDC)	Rated load(@24VDC)
Version I	F=10,000 N push	F=10,000 N pull	7 mm/s	≤ 6 mm/s
Version II	F= 4,000 N push	F= 4,000 N pull	18 mm/s	≤ 14 mm/s
Version III	F= 2,000 N push	F= 2,000 N pull	24 mm/s	≤ 22 mm/s

The provided data were determined under optimum conditions and may differ as a result of friction loss, temperature changes or external disturbances.

*Other variants are possible in special versions.

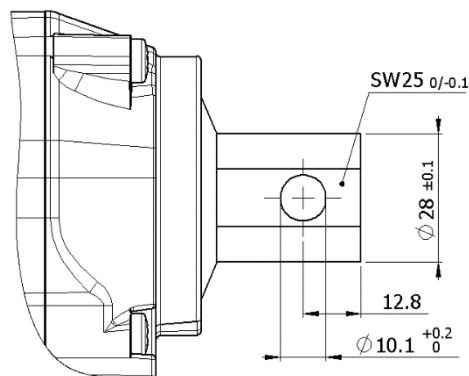
6.2 Dimensions of geometry



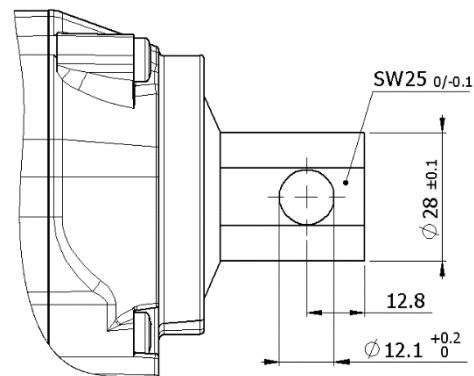
6.3 Variants of suspension

Variants of rear suspension:

Variant 1 – 4:



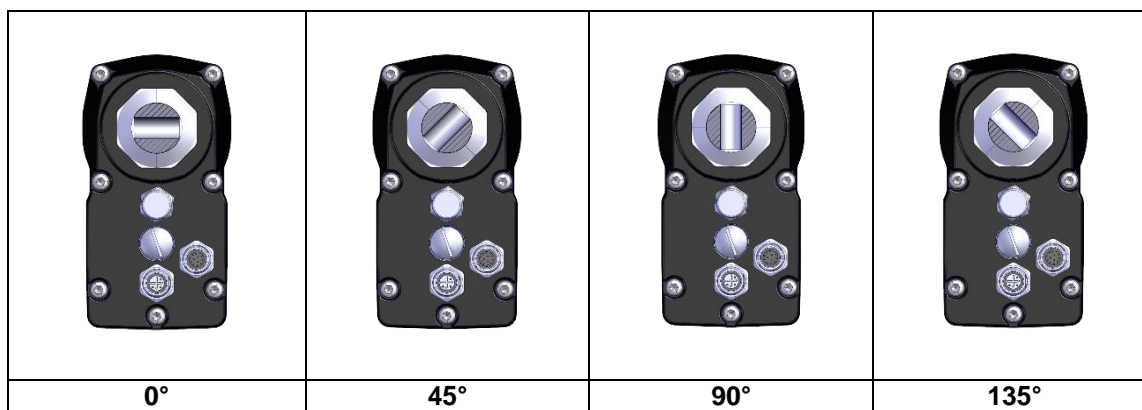
Variant 5 – 8:



Variant	Angle	Dimension
1	0°	Ø10.1 +0.2 0
2	45°	
3	90°	
4	135°	

Variant	Angle	Dimension
5	0°	Ø12.1 +0.2 0
6	45°	
7	90°	
8	135°	

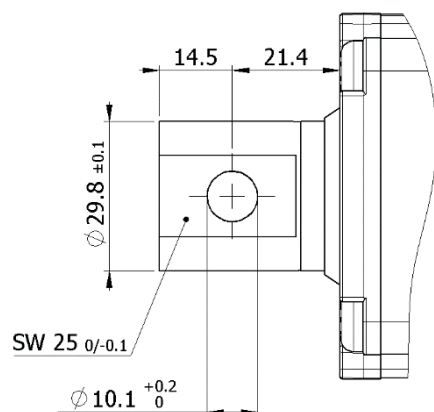
Variant 1 – 4 is only available up to 5,000 N.



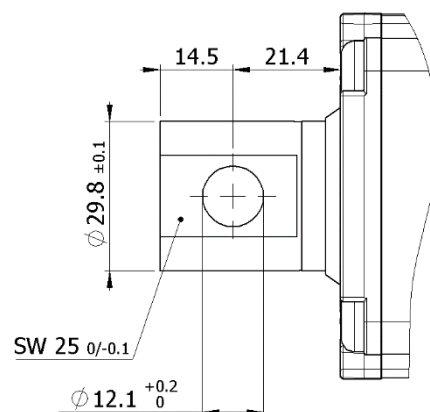
Variants of front suspension:



Variant 1:

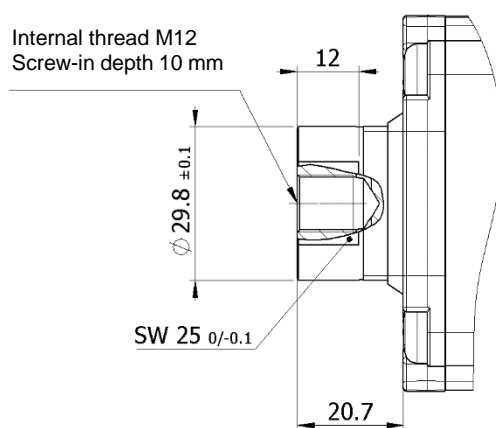


Variant 2:

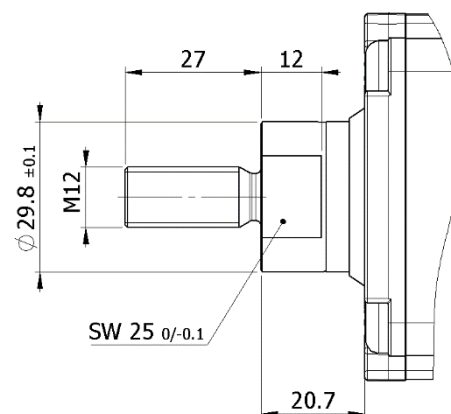


Variant 1 is only available up to 5'000 N.

Variant 3:



Variant 4:



6.4 Technical data

Stroke length	Up to 1000 mm
Dimension A (installation dimension)	Stroke less than 400 mm = stroke + 200 mm Stroke equal or greater than 400 mm = stroke + 250 mm (±1.5mm)
Standard stroke lengths	100; 150; 200; 250; 300; 350; 400; 500; 600; 700; 800; 900 und 1000 mm
Special stroke lengths / installation lengths	Customisation possible on request
Mounting position	any desired, without cross forces
Lifting force	2,000 – 10,000 N pull / push (depending on gear ratio and spindle pitch)
Lifting speed	5 – 21 mm/s (depending on load / spindle)
Protection class	IP 69k static (≅ IP 65 dynamic)
Operating voltage	12 VDC (10 – 16 VDC)** 24 VDC (16 – 28 VDC)** 36* VDC (28 – 40 VDC)** 48 VDC (44 – 52 VDC)**
Ambient temperature	–40 °C to +85 °C
Operating temperature	–20 °C to +65 °C
Self-locking	yes
Stroke tube guide	Slide bearing
Operating mode	ED 30 % Int.3 min./ 7 min. (at nominal load and operating ambient temperature from +4 °C to +40 °C)
Maintenance	maintenance-free
Colour	black powder coated / other colours on request
Electrical connection	M12, M12 signal / free cable end (also see 6.5.1)
Control options	Manual switch / SPS / supply voltage polarity

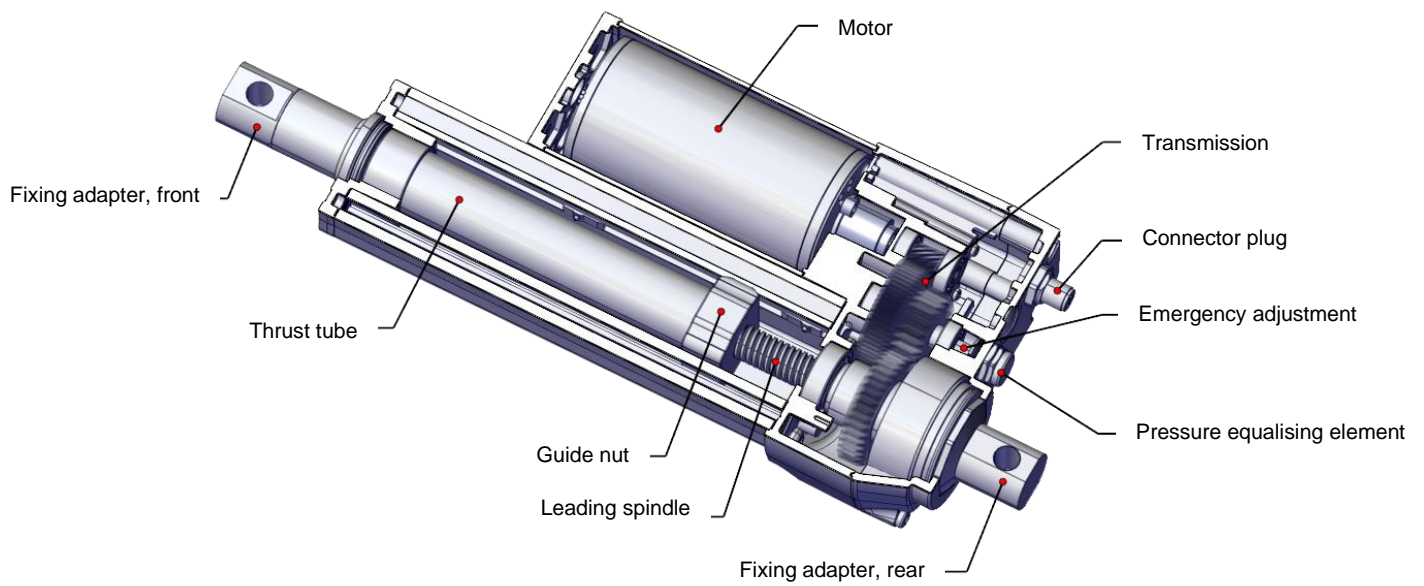
* available upon request

** measured at room temperature

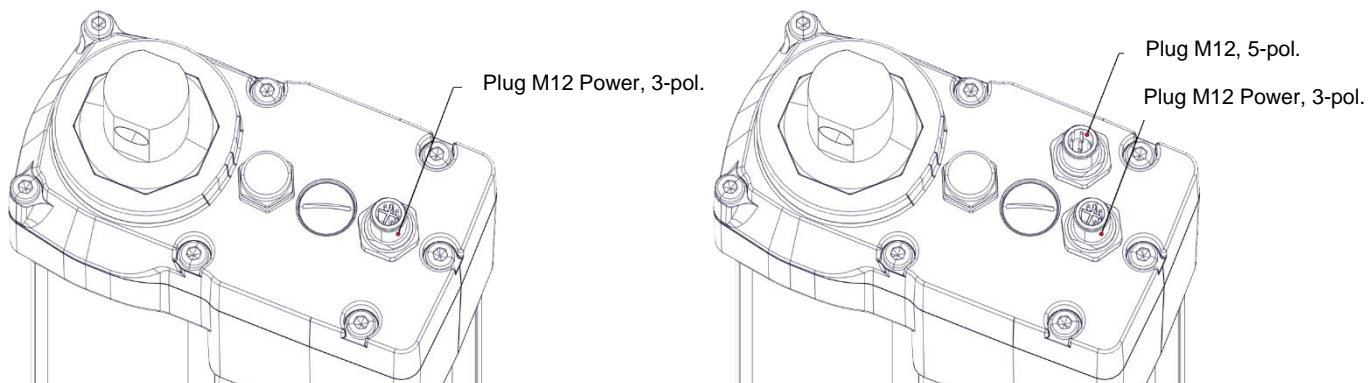
Passed verification:	
DIN EN 60529 IPX9	Schutzartprüfung nach DIN EN 60529 auf IPX9 (Wasserschutz – Abschnitt 14.2.9) a. Statisch „mit einem Blindstopfen am Motorraum“ b. Statisch „mit einem Druckausgleichselement am Motorraum“
DIN EN 60529 IP6X	Schutzartprüfung nach DIN EN 60529 auf IP6X (Staubschutz – Abschnitt 13.4 / 13.6) Ausführung: Statisch „mit einem Druckausgleichselement am Motorraum“
DIN EN ISO 9227 NSS	Salzsprühnebelprüfung nach DIN EN ISO 9227 NSS (Prüfdauer: 96 h) Ausführung: Statisch „mit einem Druckausgleichselement am Motorraum“
Temperaturwechsel	Temperaturwechseltest -40°C bis +85°C, 18 Zyklen über 144h Vorkonditionierung und Ermittlung der Widerstandsfähigkeit gegen Temperaturwechsel
Klima	Klimatest +25°C bis +55°C, Luftfeuchte 80 – 100%, 4 Zyklen über 96h Nachweis der Funktionsfähigkeit
Trockene Wärme	Trockene Wärme +105°C über 10 Tage Nachweis der Widerstandsfähigkeit bei hohen Temperaturen

IEC 60601-1-2:2014 EN 60601-1-2:2015	Medizinische elektrische Geräte - Teil 1-2 Medical electrical equipment - Part 1-2
IEC61000-4-3:2006+A1:2007+A2:2010 EN 61000-4-3:2006+A1:2008+A2:2010	Elektromagnetische Verträglichkeit (EMV) - Teil 4-3 Electromagnetic compatibility (EMC) - Part 4-3
IEC 61000-4-4:2012 EN 61000-4-4: 2012	Elektromagnetische Verträglichkeit (EMV) - Teil 4-4 Electromagnetic compatibility (EMC) - Part 4-4
IEC 61000-4-2:2008 EN 61000-4-2:2009	Elektromagnetische Verträglichkeit (EMV) - Teil 4-2 Electromagnetic compatibility (EMC) - Part 4-2
IEC 61000-4-5:2014+A1:2017 EN 61000-4-5:2014+A1:2017	Elektromagnetische Verträglichkeit (EMV) - Teil 4-5 Electromagnetic compatibility (EMC) - Part 4-5
CISPR 11:2015+A1:2016 EN 55011:2016+A1:2017	Industrielle, wissenschaftliche und medizinische Geräte Industrial, scientific and medical equipment

Overview diagram of the electric cylinder

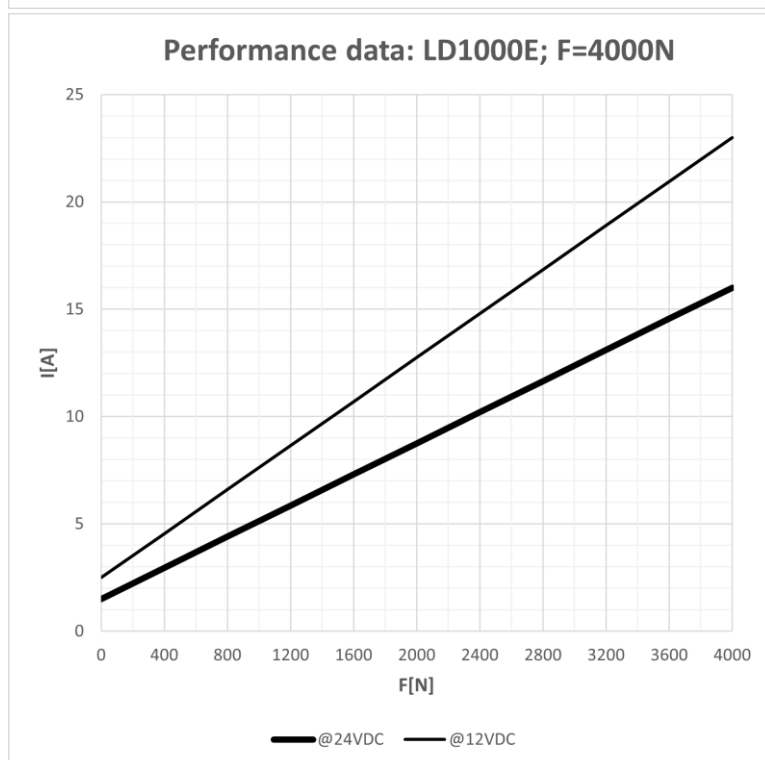
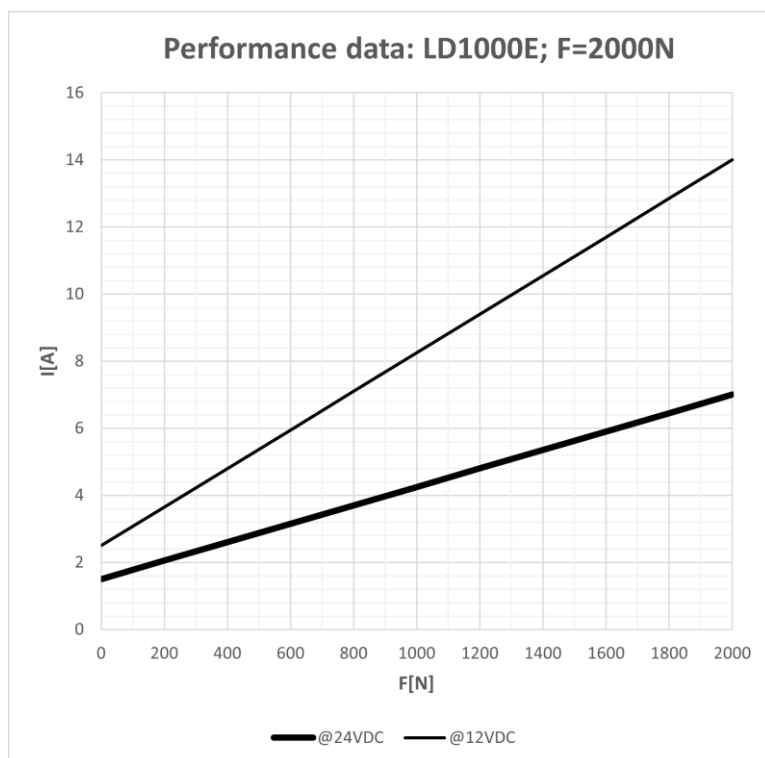


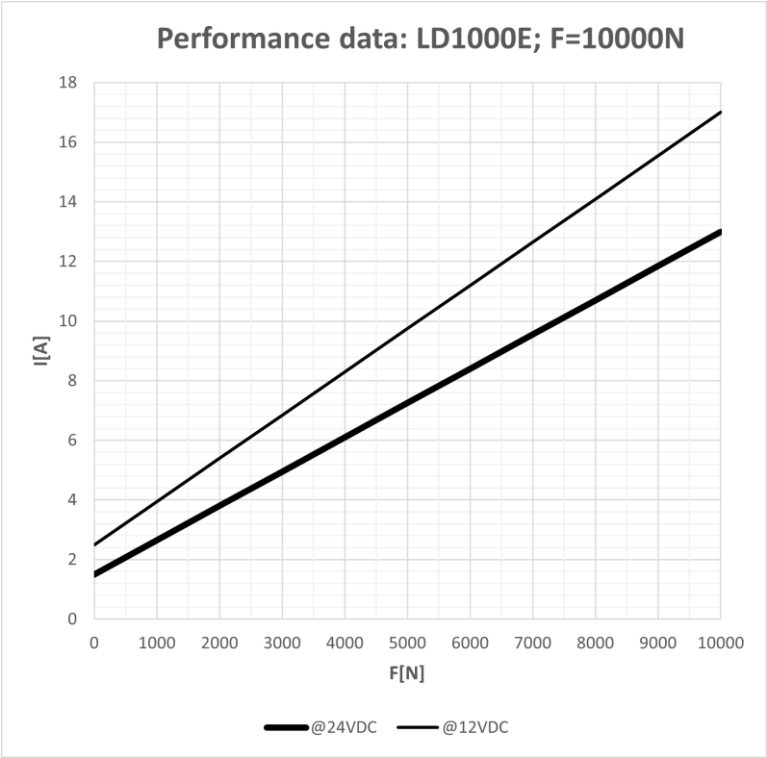
6.5 Plugs / connectors option overview



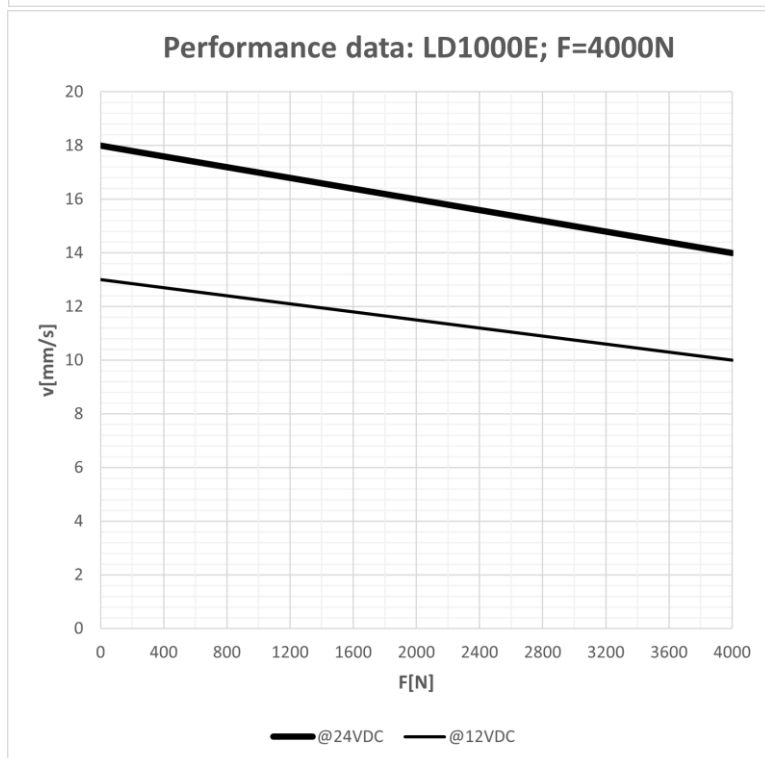
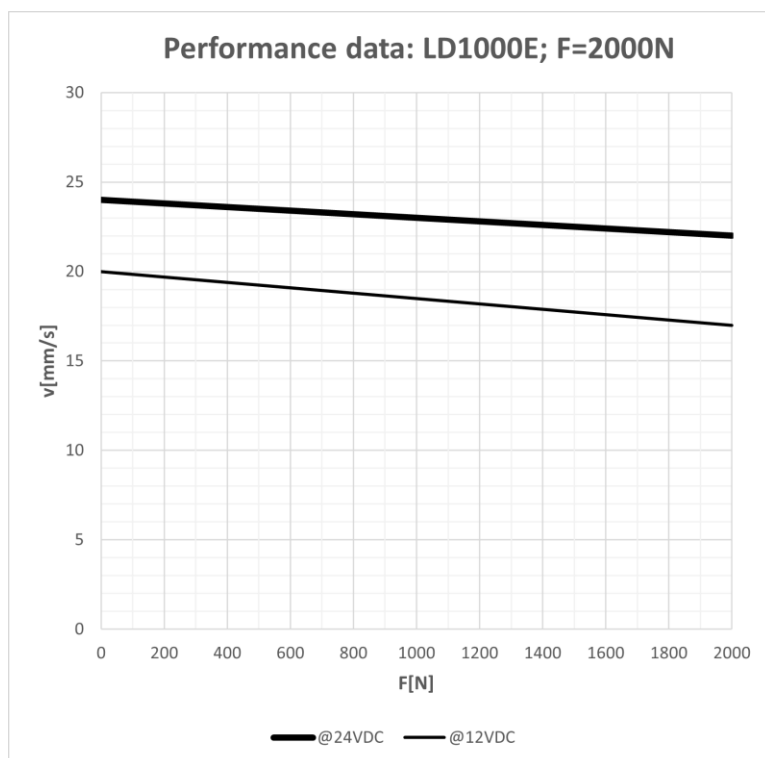
6.6 Performance chart

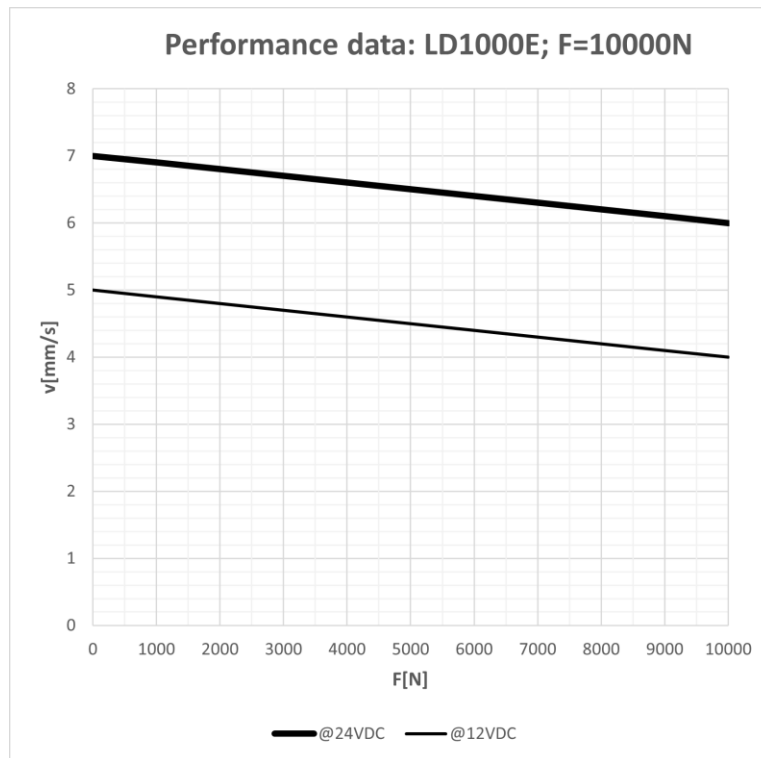
6.6.1 Current consumption





6.6.2 Speed





6.6.3 Weight data

Stroke [mm]	EBL [mm]	Weight [kg]
100	300	5.7
150	350	6
200	400	6.4
250	450	6.7
300	500	7
350	550	7.3
400	650	8
500	750	8.6
600	850	9.3
700	950	9.9
800	1050	10.6
900	1150	11.2
1000	1250	11.8

*The given weight data can vary slightly due to different attachment parts (customer specific).

7 Life phases

7.1 Electric cylinder scope of delivery

The electric cylinder is delivered as an individual component. The controls and manual switches and / or accessories are not included in scope of delivery.

7.2 Transport and storage

The product is to be checked by suitable personnel for visible and functional damage. Damage caused by transport and storage must be reported to the responsible person and Phoenix Mecano Solutions AG immediately.

Commissioning damaged electric cylinders is forbidden.

The ambient conditions for the storage of the electric cylinder are prescribed as follows:

- air must not contain oils
- contact with solvent-based paints must be avoided
- lowest / highest ambient temperature: $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$
- air pressure: from 700 to 1060 hPa

Divergent ambient factors must be approved by Phoenix Mecano Solutions AG.

7.3 Important information on installation and commissioning



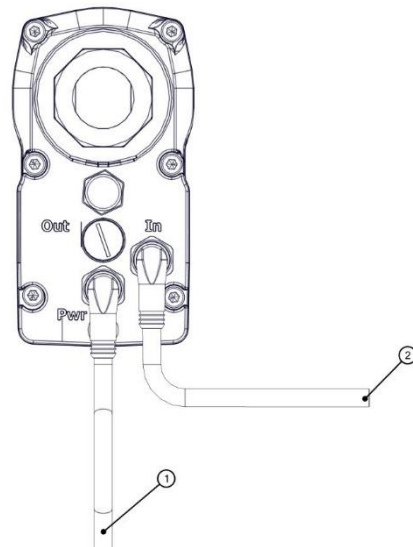
It is essential that you note and follow the following instructions. Otherwise persons can be injured or the electric cylinder and/or other components damaged.

- It is essential to implement an emergency stop onsite, which could interrupt reliably the operating voltage in the event of a failure or malfunction of the incomplete machine!
- No additional holes may be made in the electric cylinder.
- After setting up and commissioning, it is essential that the plug of the power supply is freely accessible.
- The electric cylinder must not be moved to "Stop". Risk of mechanical damage.
- The electric cylinder may not be opened.
- The user must ensure that there is no danger when the power supply is active.
- Pinch and shear points must be avoided in the design of the applications with this electric cylinder. These must be secured and marked correspondingly.
- Automatic start-up of the electric cylinder caused by a defect is to be stopped immediately by disconnecting the power supply (see Emergency stop).
- If the supply line is damaged, the electric cylinder must be taken out of operation immediately.
- The pushrod with suspension must be secured against twisting. Non-observance leads to the adjustment of the stroke end position.
- The electric cylinder has not been designed for continuous operation. The number of starts per hour determined for your application may not be exceeded.

7.4 Initial commissioning

7.4.1 Single drive

Please connect the electric cylinder according to the following diagram. First connect the power cable plug ① with the device installation plug on the drive with the inscription "PWR". Then plug the connector plug of the signal cable or the manual switch ② in the installation



plug marked "In".

Connect the connector lead with your control system and the stabilized power supply according to the connection diagram (see Chapter 8). Before connecting, always verify the deenergized status of the control system and the power supply unit. Make sure that no short circuit can occur between the flexes and that they have no contact with conductive surfaces. This could permanently damage the cylinder.

7.5 Assembly

After the receipt of the electric cylinder, check the device for any damage. The electric cylinder is delivered ready for operation without a controller.

The installation of the LD1000E consists in fixing the electric cylinder using the rear and front suspensions. (here, note your special suspension variants; see 6.3.1 "Variants of suspension")

The cross bores of both suspensions measure 12.1 ± 0.1 mm according to the standard. The fastening bolts are not included in the scope of delivery.

The following instructions must be observed during installation:

Stroke end positions are set with the pushrod. The pushrod is not secured against twisting. This means that a turning (rotation) of the pushrod - or the fixed swivel head - is equal to an adjustment of the end positions!

Attention: The attachment points for installation of the electric cylinder must be aligned flawlessly to ensure the safe and flawless operation!

Action of lateral forces on the pushrod must be excluded!

- When a swivel head or clevis is used/assembled, the head must be correctly locked using the lock nut supplied.
- A test or trial run must be performed.



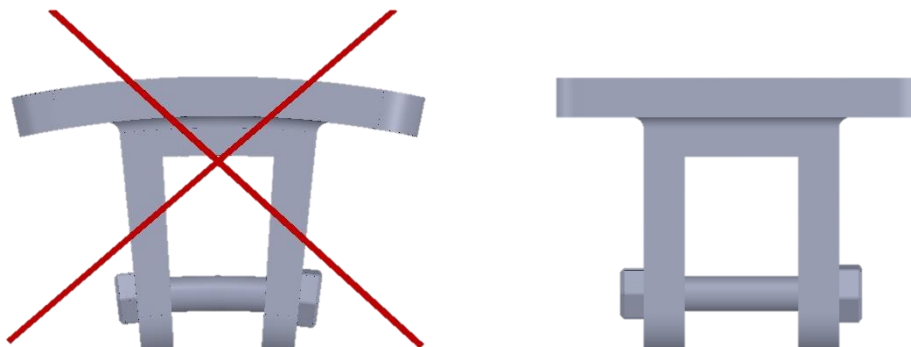
**Non-compliance with this procedure will cause damage to the electric cylinder!
This nullifies the guarantee!**

The installation positions of the components must ensure that pinch and shear points are avoided, particularly taking into consideration any future applications.

Take care to prevent tripping hazards by proper and safe laying of the supply lines / cables!

It is very important to ensure that the mounted electric cylinder can move freely in the attachment points / that the electric cylinder is neither strained nor buckled. Improper assembly and any emergency situation associated with it would damage the drive and prevent it from operating smoothly!

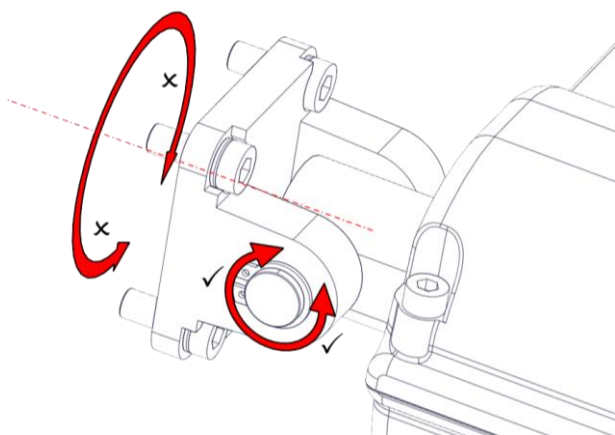
- The assembly bolts or fastening screws (no shoulder set screws) must be available in the correct size (pay attention to the hole diameter of the cylinder uptakes).
- The bolts and nuts must be manufactured of high-quality steel (for example, 10.8). There may not be any threads on the nuts in the rear uptake nor at the piston rod eye.
- The screws and nuts must be tightened tight enough that they cannot come loose.
- However, do not use too high a torque on the screws in the rear uptake since otherwise the uptakes will be unnecessarily strained.



7.5.1 Installation procedure

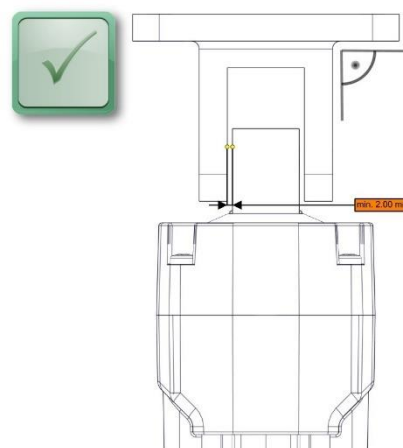
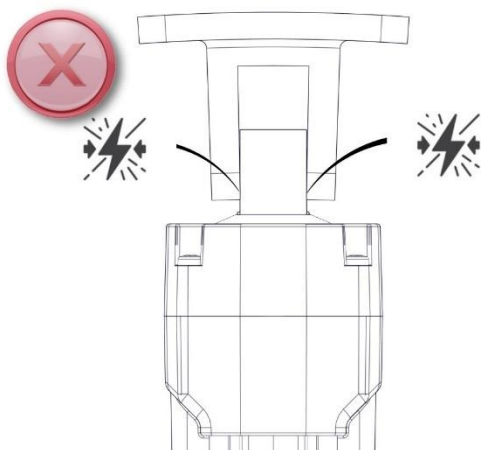
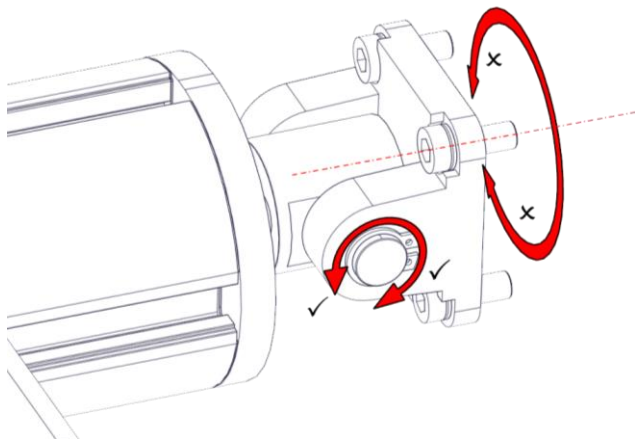
1. Hang the rear suspension onto the counterpart piece.

Attention: It should not be possible to rotate the counterpart piece. It must be possible to rotate the electric cylinder in the direction of the arrow (see figure).



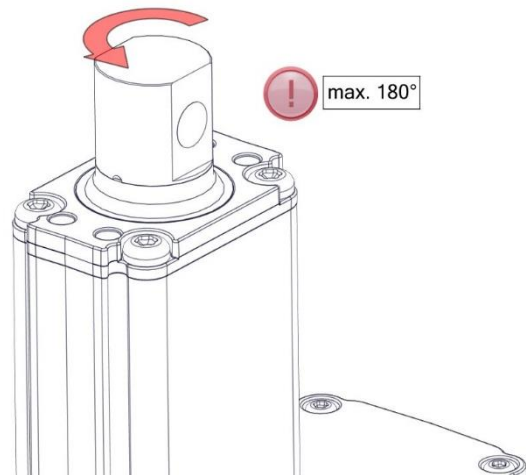
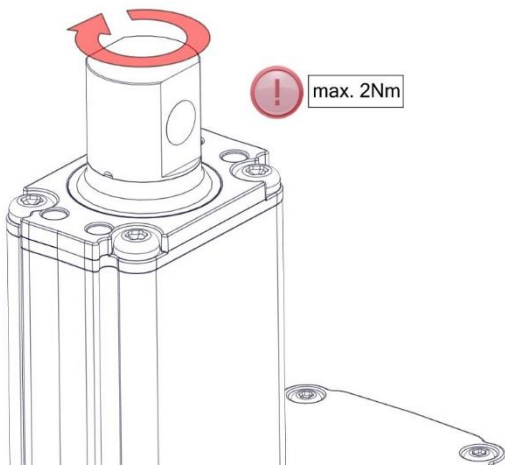
2. Fix the suspension at the front.

Attention: It should not be possible to rotate the counterpart piece. It must be possible to rotate the electric cylinder in the direction of the arrow (see figure).



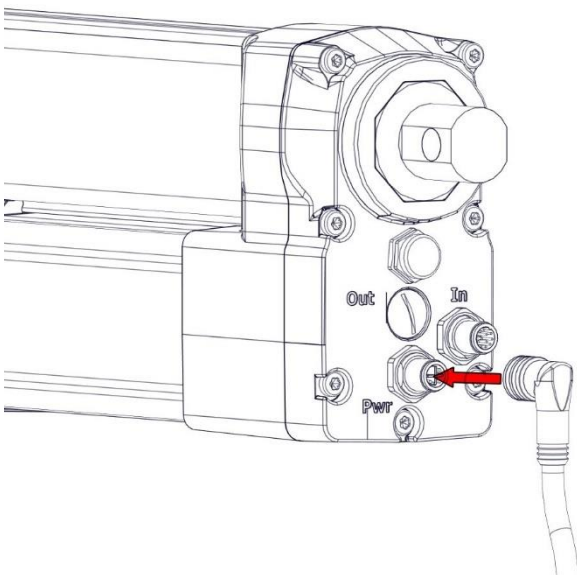


Caution: Since the push rod is not secured against twisting (even pinning in special designs does not offer 100% security), the push rod eye may only be turned in the range between 0° and 180°! If the push rod eye is not in the desired position for your installation situation, please screw it in with the torque specified on the screen. Then turn the push rod eye anti-clockwise to the desired position (**max. 180°**). **During normal operation, the push rod must never be fully screwed in or screwed in by a load that is not secured against torsion! The lead nut would be severely deformed and destroy the actuator!**



3. Connect the (3-pin) connector plug to PWR" (plug in & hand tighten the sleeve nut)
Connect the connector lead with your control system and the stabilized power supply according to the connection diagram (see Chapter 8). Before connecting, always verify the deenergized status of the control system and the power supply unit. Make sure that no short circuit can occur between the flexes and that they have no contact with conductive surfaces. This could permanently damage the cylinder.

Attention: do not connect with reverse polarity (pay attention to connection diagrams in Chapter 8)!



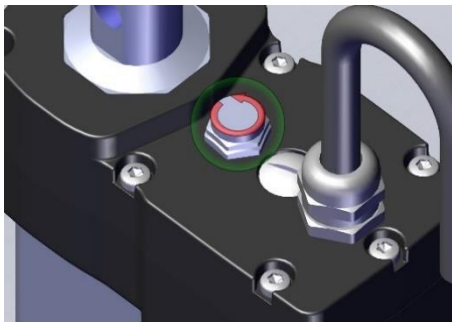
4. Perform test run / initial run without load and check operability of the system.

7.5.2 Emergency mechanical adjustment

Attention: Please read this chapter through completely before beginning implementation!



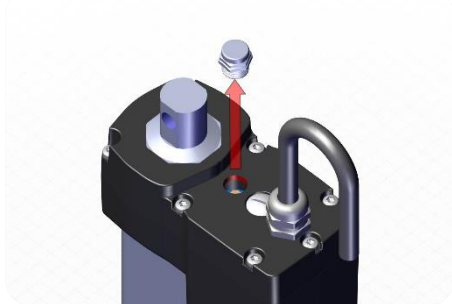
You must first ensure that the power supply is disconnected and automatic restart is ruled out!



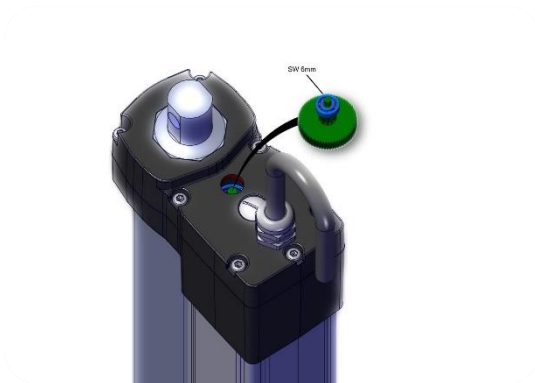
Remove the pressure equalizing element with a 19 mm open-end / ring spanner.



Please ensure that there is NO LONGER any IP-protection on the electric cylinder with the disassembled pressure equalizing element!



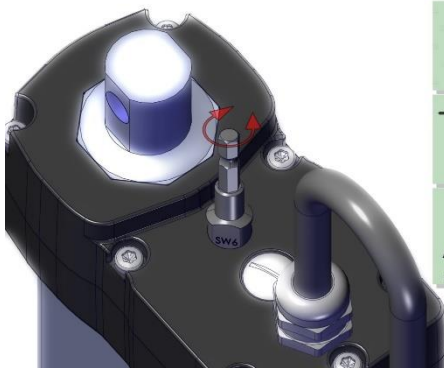
Take off the pressure equalizing element and stow it away safely:



A transmission gear with a pressed-on deep-groove ball bearing and a hexagonal pin (SW 6 mm) can be seen in the opening:



Put on a standard socket wrench (plug-in bolt 6 mm).



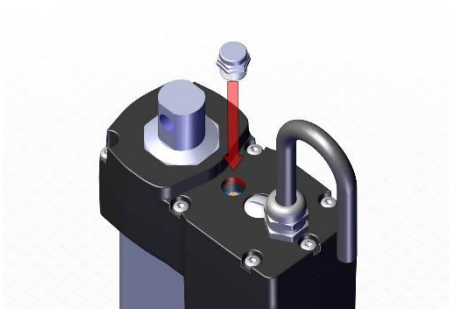
A standard ratchet or cordless screwdriver can be used to help adjust the drive (pushrod is driven in or out).



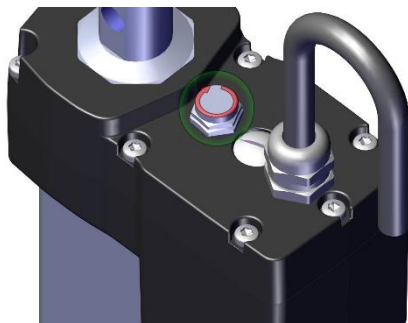
Please ensure that a maximum speed of rotation of **150 1/min** is NOT exceeded!

Exceedance would drive the motor to strongly so that it would work as a generator and induce voltage in the built-in control system. That would brake the motor and in some circumstances cause electronic components to “come to life” on the control print.

Make sure that the end-positions (**retracted = installation length** and **extended = installation length + stroke length**) are NOT exceeded (Table: 6.7.3) by repeatedly measuring the installation length with a standard tape measure or folding rule!



After you have released the drive from the application and removed it, take off the socket wrench again (nut) and screw on the pressure equalizing element again.



Hand tighten the pressure equalizing element back on using an open-end / ring spanner.



The cylinder will be wrongly positioned after the adjustment. If the cause of the EMERGENCY mechanical adjustment was a power supply outage and it can be assumed that the drive will continue to be fully functional, the drive can continue to be operated without further action. As soon as the drive is next driven to the S2 end switch plate (retracted), it will go back to the installation length again.

If the cause was a defective drive, please shut down the plant / application and contact the manufacturer.

EMERGENCY mechanical adjustment is **NOT** a normal operating mode! It is only used for the purpose of bringing a system, application, machine etc. to a safe position in order to rectify the previous fault or to replace the defective drives!

7.6 Maintenance

The electric cylinder is basically maintenance-free, but is not wear-free.

Faulty functioning, excessive play of the movable parts or unusual sounds generated by the electric cylinder can be the signs of wear.

Worn parts of the product must only be replaced by the manufacturer. The electric cylinder must be sent to the manufacturer for these works. In the case of wear without replacement of the worn product parts, the safety of the product cannot be guaranteed.

Any works with the electric cylinder may only be carried out according to this instruction. The device may only be opened by authorised and trained specialist personnel.

In case of any defect of the drive, we recommend to contact the manufacturer and/or send this electric cylinder for repair.

- When working on electric circuits or elements, these must first be disconnected from the supply to prevent the risk of injury.
- For safety reasons, unauthorised modifications or changes of the electric cylinder are prohibited.
- Safety-related devices must be tested on a regular basis depending on the frequency of use, however at least once a year for integrity and operability.

7.7 Cleaning

You can clean the manual switch and the external surface of the electric cylinder profile using a lint-free, clean cloth.



Solvent-based cleaners attack and can damage the material.

Attention: Protection class of the manual switch is not IP69K, but IP40, and therefore may not be washed using the high-pressure cleaner and exposed to moisture, which would immediately lead to damage!

7.8 Disposal and return

The electric cylinder must either be disposed of in accordance with the applicable regulations and guidelines, or returned to the manufacturer.

The manufacturer reserves the right to charge for the disposal of this drive.

The electric cylinder contains electronic components, cables, metals, plastics etc. and is to be disposed of in accordance with the applicable environmental regulations of the respective country.

In the European Economic Area, the disposal of the product is governed by the EU Directive 2002/95/EC or the relevant national legislation.

A Connection plans

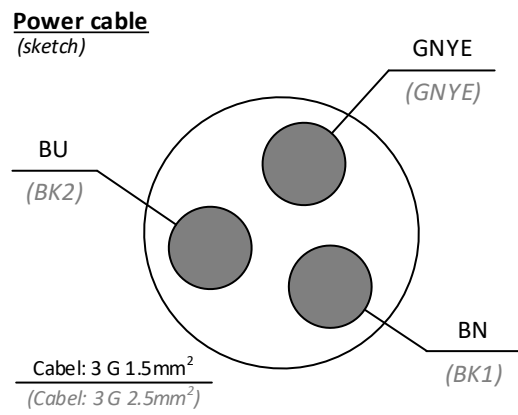
On the following pages you can view the available connection plans.

General explanation: A connection plan defines the connectors/cables, their assignment, as well as a part of the specification and the available functions. In most cases, various connection examples are also shown to provide you with the best possible support during planning.

Each connection plan starts with "AP.4." followed by a number with at least six digits. → Example: AP.4.000000. The number of the connection plan can be found on the type plate, as well as on the specification sheet.

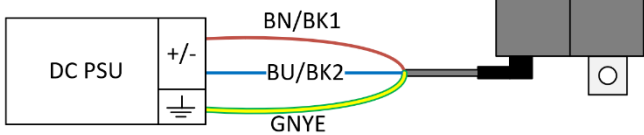
Connection plan AP.4.017712

Cable



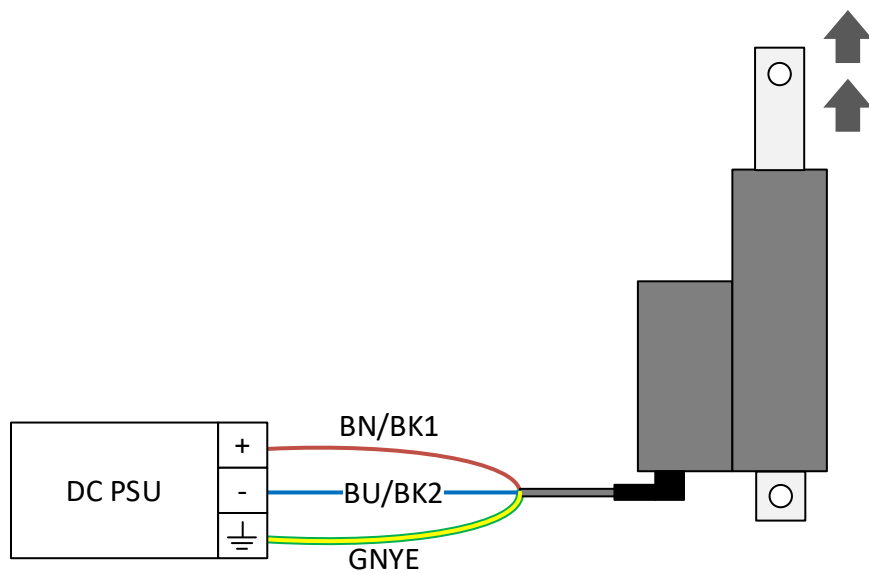
Power cable
*** Supply voltage ***

Pwr

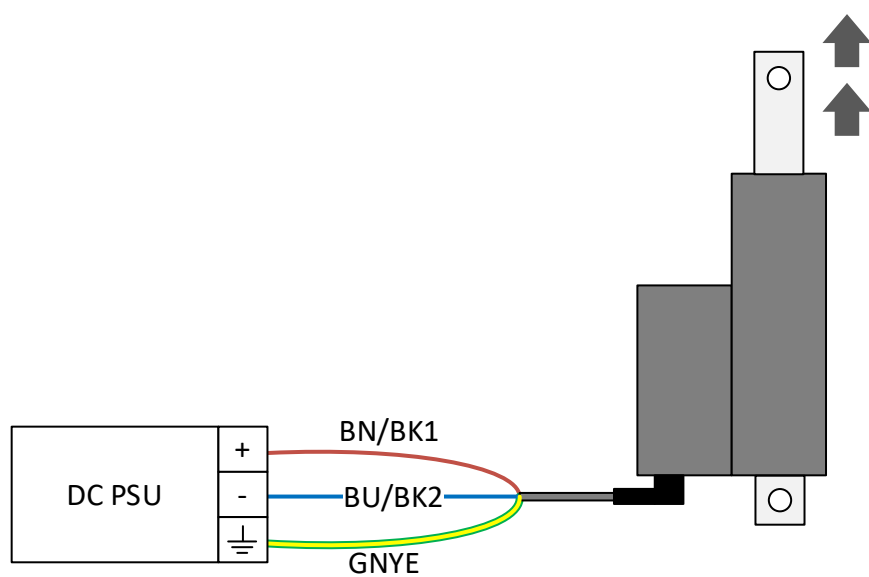
Wire	Description																			
1.5mm ² : Green-Yellow (GNYE) 2.5mm ² : Green-Yellow (GNYE)	Functional earth	<p>DC supply voltage</p> <p>The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).</p> <p>The green-yellow (GNYE) wire is to be connected to earth.</p> <p>Control</p> <p>The cylinder extends or retracts according to the polarity of the power supply.</p> <div></div> <table><tr><th></th><th>Brown</th><th>Blue</th></tr><tr><td>Retract</td><td>Minus</td><td>Plus</td></tr><tr><td>Extend</td><td>Plus</td><td>Minus</td></tr></table> <table><tr><th></th><th>BK1</th><th>BK2</th></tr><tr><td>Retract</td><td>Minus</td><td>Plus</td></tr><tr><td>Extend</td><td>Plus</td><td>Minus</td></tr></table>		Brown	Blue	Retract	Minus	Plus	Extend	Plus	Minus		BK1	BK2	Retract	Minus	Plus	Extend	Plus	Minus
	Brown	Blue																		
Retract	Minus	Plus																		
Extend	Plus	Minus																		
	BK1	BK2																		
Retract	Minus	Plus																		
Extend	Plus	Minus																		
1.5mm ² : Brown (BN) 2.5mm ² : Black 1 (BK1)	DC power supply																			
1.5mm ² : Blue (BU) 2.5mm ² : Black 2 (BK2)																				

Example

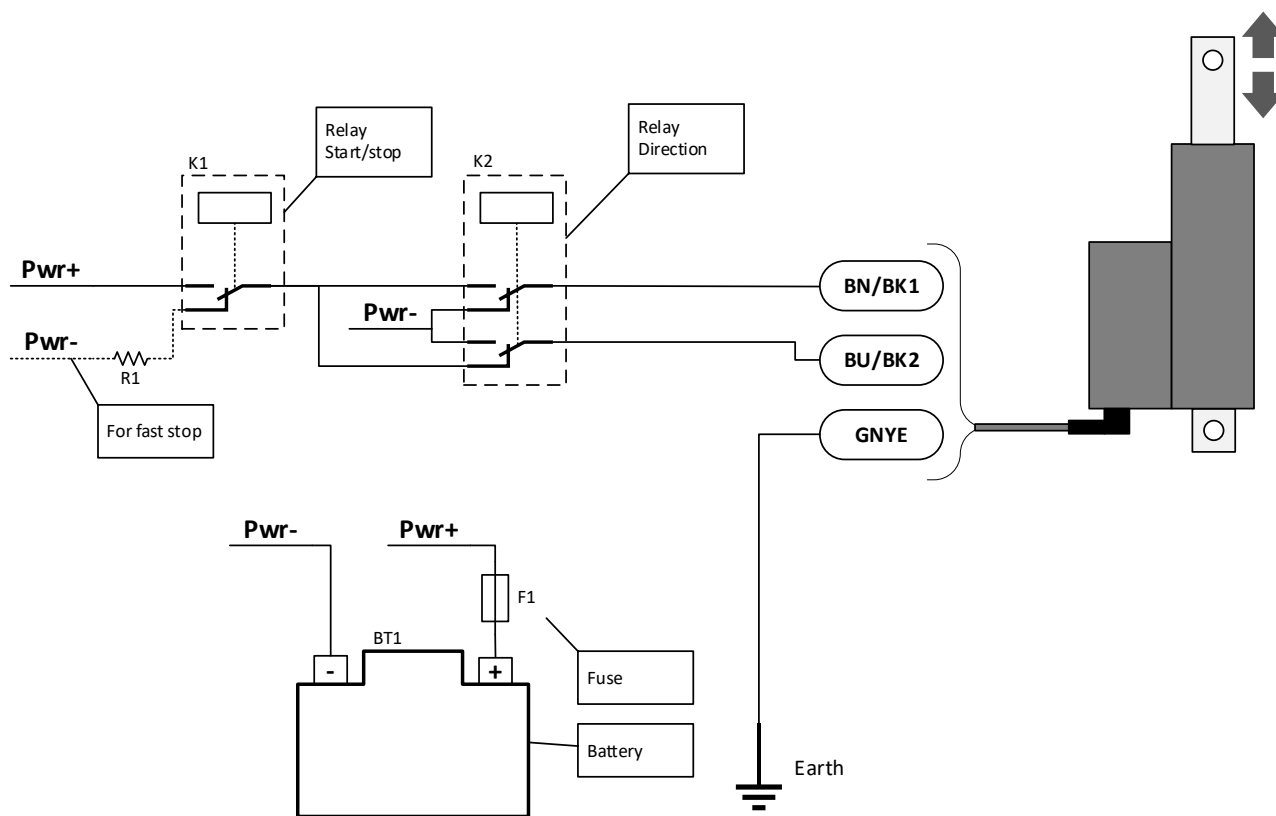
Connection example – Extend



Connection example – Retract



Control example - relay

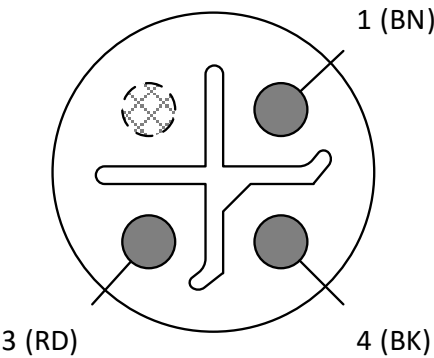


Note: Do not change the direction during the drive. Always stop the motion via relay K1 before changing the direction with K2.

Connection plan AP.4.017713

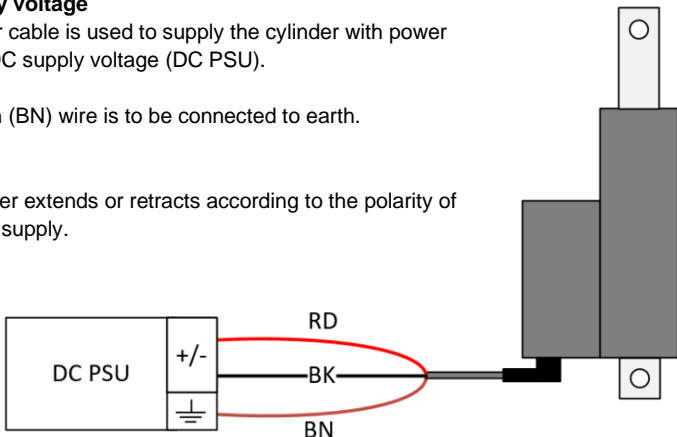
Cable

M12power
(top view)



Pin assignment M12power (3-pin)
*** Supply voltage ***

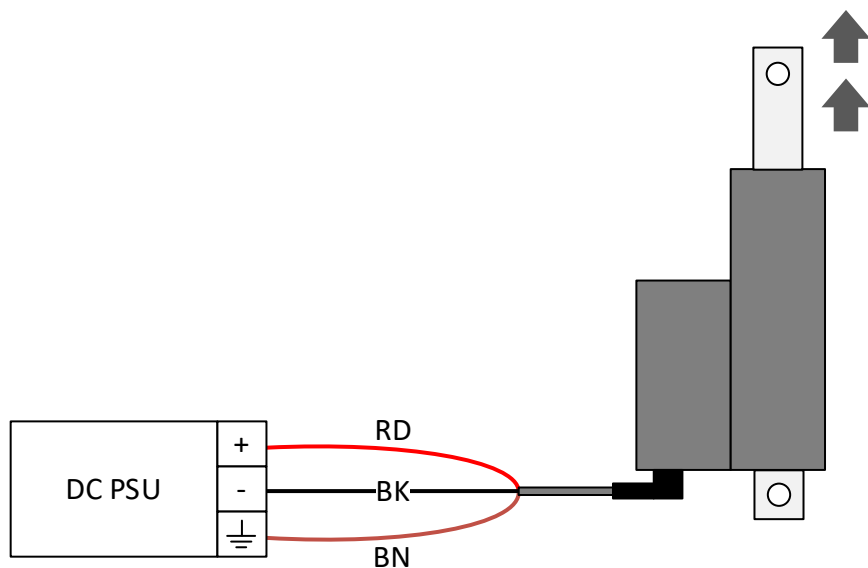
Pwr

Pin	Description	
Pin 1 Brown (BN)	Functional earth DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). The brown (BN) wire is to be connected to earth. Control The cylinder extends or retracts according to the polarity of the power supply.	
Pin 3 Red (RD)		
Pin 4 Black (BK)		

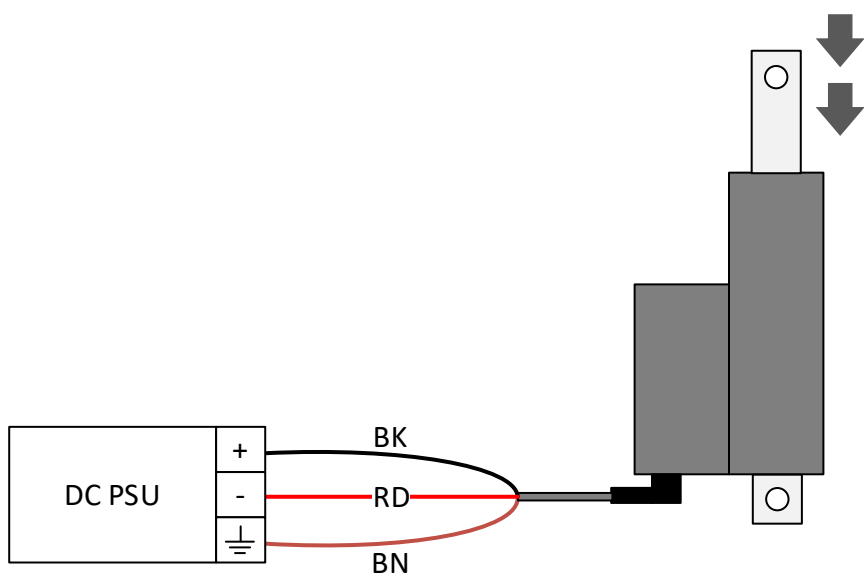
	Red	Black
Retract	Minus	Plus
Extend	Plus	Minus

Example

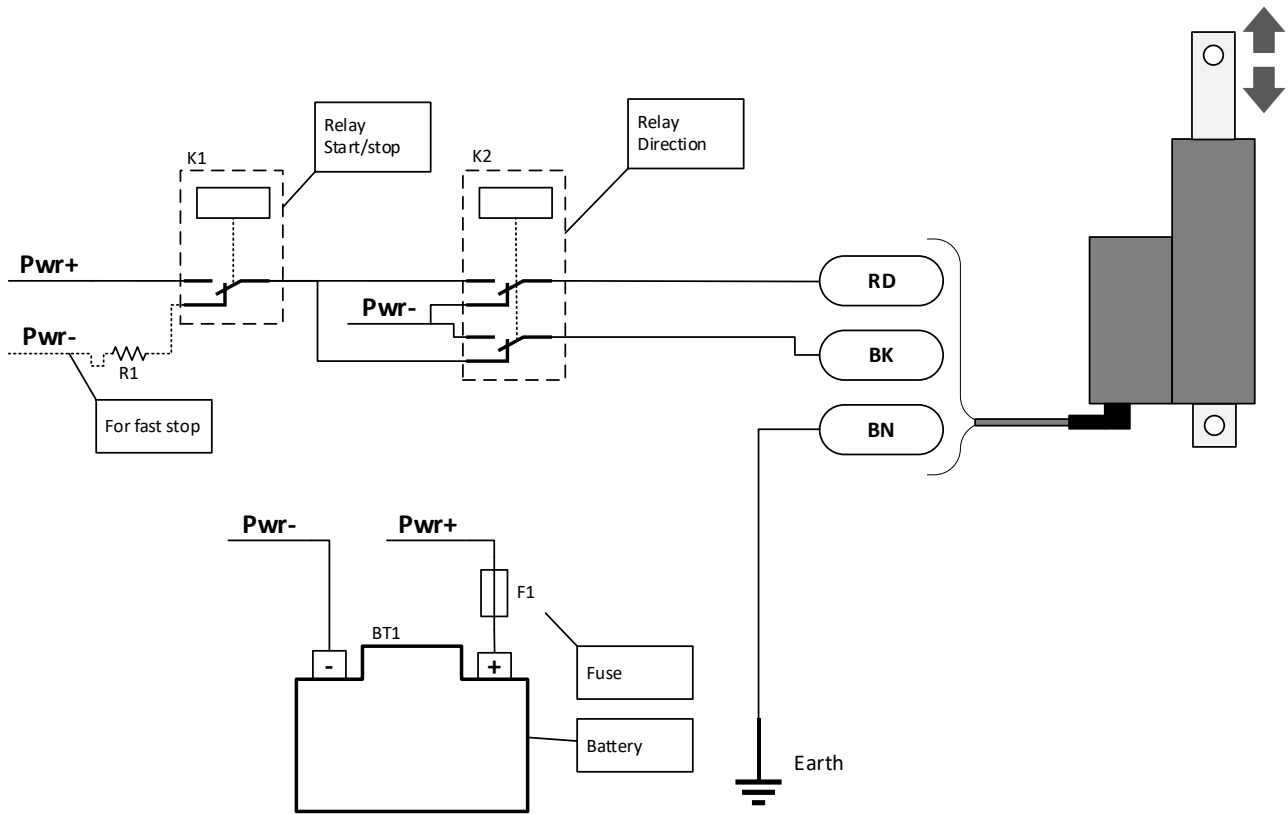
Connection example – Extend



Connection example – Retract



Control example - relay

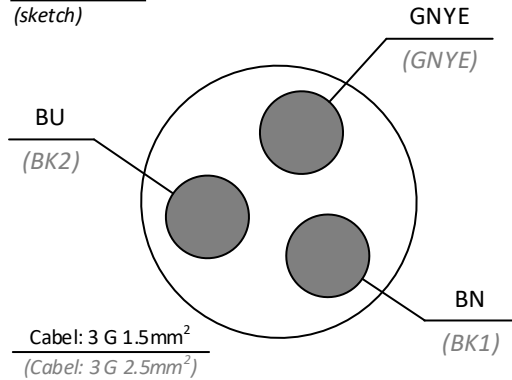


Note: Do not change the direction during the drive. Always stop the motion via relay K1 before changing the direction with K2.

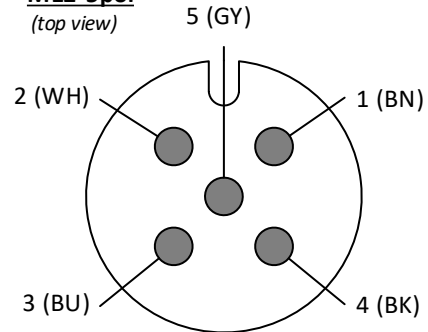
Connection plan AP.4.017714

Cable

Power cable
(sketch)



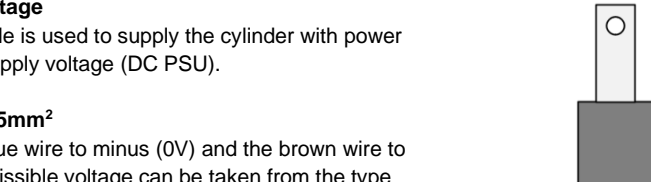
M12-5pol
(top view)



Power cable

*** Supply voltage ***

Pwr

Wire	Description		
1.5mm ² : Green-Yellow (GNYE) 2.5mm ² : Green-Yellow (GNYE)	Functional earth	<p>DC supply voltage</p> <p>The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).</p> <p>Wiring with 1.5mm²</p> <p>Connect the blue wire to minus (0V) and the brown wire to plus. The permissible voltage can be taken from the type plate.</p>  <p>The diagram shows a DC PSU with three terminals: a positive terminal (+), a negative terminal (-), and a ground terminal (indicated by a ground symbol). Three wires are connected to these terminals: a brown wire labeled BN/BK1 to the positive terminal, a blue wire labeled BU/BK2 to the negative terminal, and a green-yellow wire labeled GNYE to the ground terminal. These wires then connect to a grey cylindrical component with two terminals on its side.</p>	
1.5mm ² : Brown (BN) 2.5mm ² : Black 1 (BK1)			DC power supply
1.5mm ² : Blue (BU) 2.5mm ² : Black 2 (BK2)			<p>Wiring with 2.5mm²</p> <p>Connect black wire 2 (BK2) to minus (0V) and black wire 1 (BK1) to plus. The permissible voltage can be taken from the type plate.</p> <p>General</p> <p>The green-yellow (GNYE) wire is to be connected to the ground.</p>

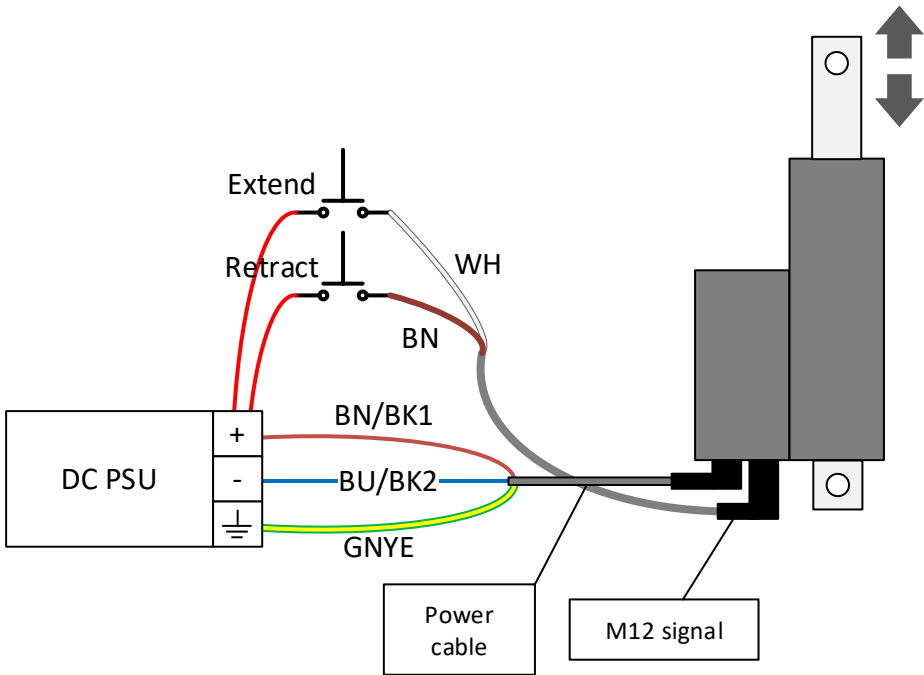
Pin assignment M12 Signal (5-pin)
 *** Communication & control plug ***

In

Pin	Description
Pin 1 Brown (BN)	Control You can retract and extend the cylinder via the two wires. By applying a voltage, for example the supply voltage of the cylinder, to the brown wire (pin 1), the cylinder retracts. The definition of the wires is as follows: <ul style="list-style-type: none"> Pin 1 (BN): Retract Pin 2 (WH): Extend
Pin 2 White (WH)	
Pin 3 Blue (BU)	Voltage level <ul style="list-style-type: none"> Drive: 8.0 ... 30.0 VDC* Stop: 0.0 ... 0.8 VDC* *to GND (Pin 5)
Pin 4 Black (BK)	
Pin 5 Grey (GY)	GND of the linear drive Low-resistance GND connection of the linear drive. Do not connect to the supply voltage!

Example

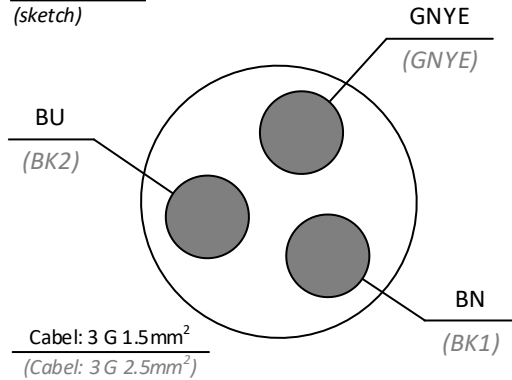
Connection example



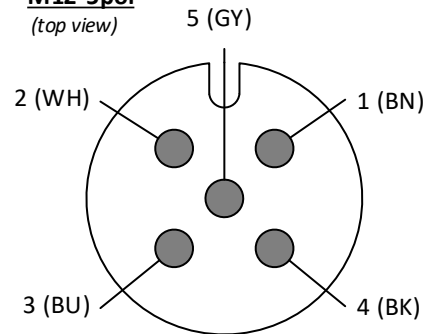
Connection plan AP.4.017715

Cable

Power cable
(sketch)



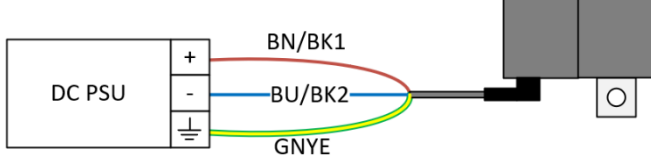
M12-5pol
(top view)



Power cable

*** Supply voltage ***

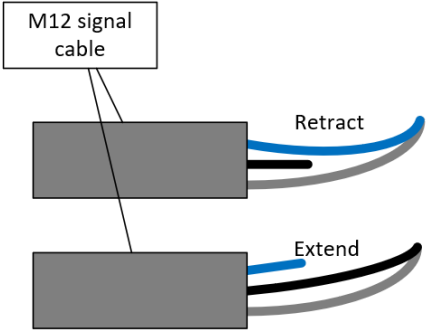
Pwr

Wire	Description	
1.5mm ² : Green-Yellow (GNYE) 2.5mm ² : Green-Yellow (GNYE)	Functional earth	<p>DC supply voltage</p> <p>The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).</p> <p>Wiring with 1.5mm²</p> <p>Connect the blue wire to minus (0V) and the brown wire to plus. The permissible voltage can be taken from the type plate.</p>  <p>Wiring with 2.5mm²</p> <p>Connect black wire 2 (BK2) to minus (0V) and black wire 1 (BK1) to plus. The permissible voltage can be taken from the type plate.</p> <p>General</p> <p>The green-yellow (GNYE) wire is to be connected to the ground.</p>
1.5mm ² : Brown (BN) 2.5mm ² : Black 1 (BK1)		
1.5mm ² : Blue (BU) 2.5mm ² : Black 2 (BK2)		

Pin assignment M12 Signal (5-pin)
*** Communication & control plug ***

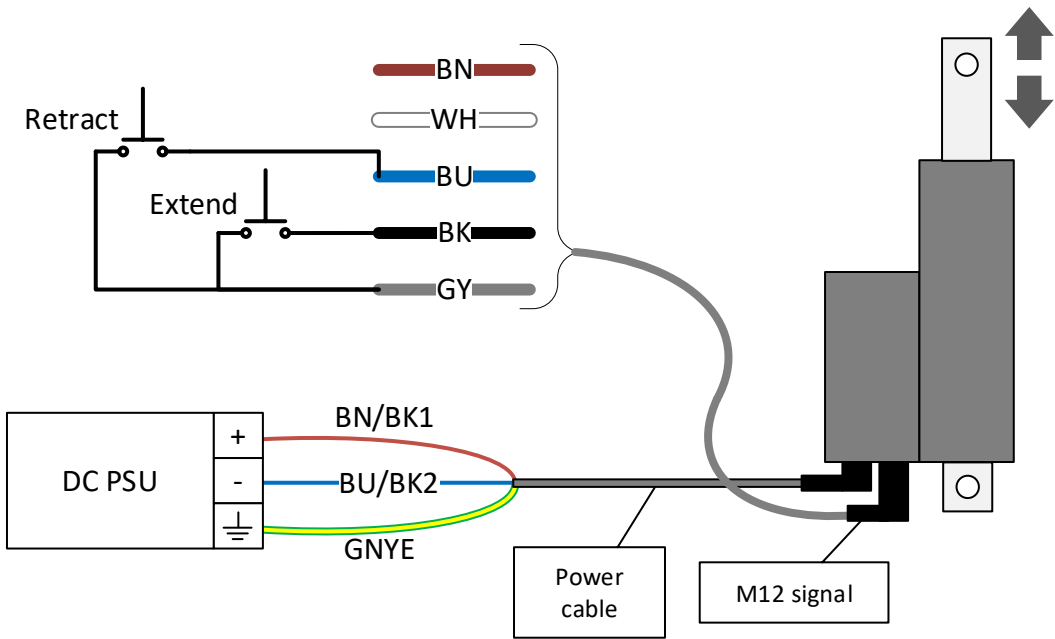
In

Pin	Description
Pin 1 Brown (BN)	Not connected Leave unconnected
Pin 2 White (WH)	
Pin 3 Blue (BU)	Control Connect the black (BK) wire to the grey (GY) wire to extend the cylinder. Connect the blue (BU) wire to the gray (GY) wire to retract the cylinder. The cylinder stops automatically in the end position. <ul style="list-style-type: none">Pin 3 (BU): RetractPin 4 (BK): Extend <u>Specification</u> <ul style="list-style-type: none">Connected: ≤ 10 ΩDisconnected: ≥ 100k Ω
Pin 4 Black (BK)	
Pin 5 Grey (GY)	GND of the linear drive Low-resistance GND connection of the linear drive. Do not connect to the supply voltage!



Example

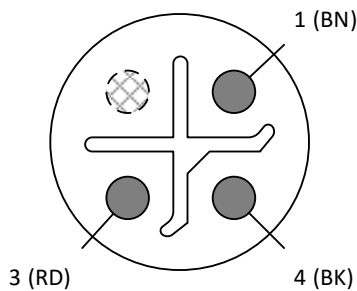
Connection example



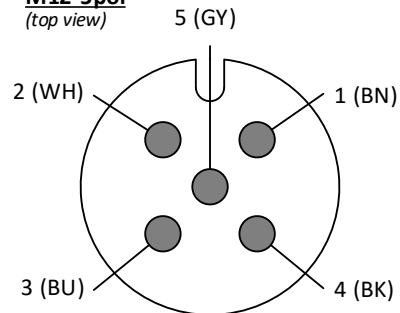
Connection plan AP.4.017716

Pin assignment

M12power
(top view)



M12-5pol
(top view)



Pin assignment M12power (3-pin)

*** Supply voltage ***

Pwr

Pin	Description	
Pin 1 Brown (BN)	Functional earth	<p>DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).</p> <p>Connection Connect the black wire to minus (0V) and the red wire to plus. The permissible voltage can be found on the type plate.</p> <p>The brown (BN) wire is to be connected to earth.</p>
Pin 3 Red (RD)	DC power supply	
Pin 4 Black (BK)		

Pin assignment M12 Signal (5-pin)

*** Communication & control plug ***

In

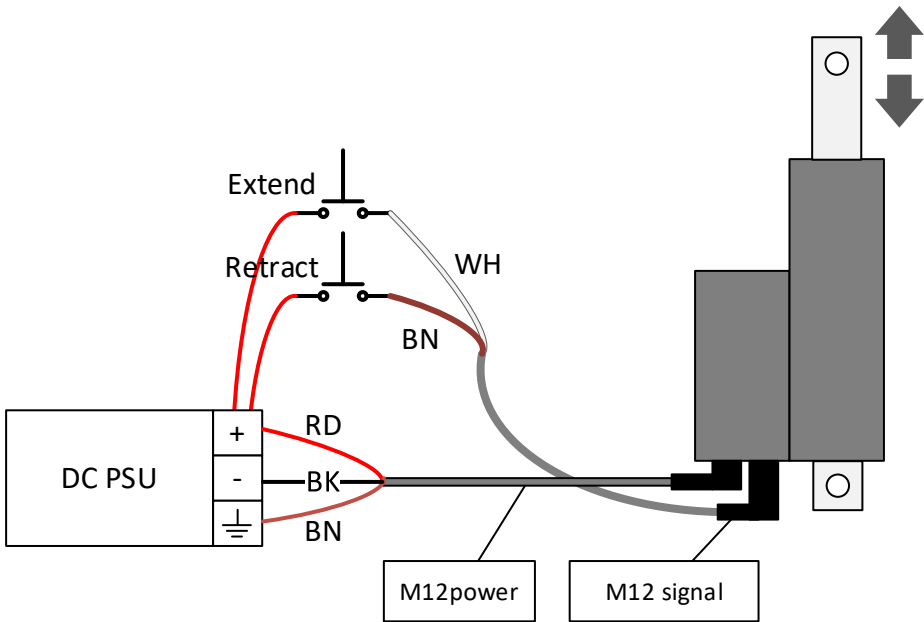
Pin	Description
Pin 1 Brown (BN)	<p>Control You can retract and extend the cylinder via the two wires. By applying a voltage, for example the supply voltage of the cylinder, to the brown wire (pin 1), the cylinder retracts. The definition of the wires is as follows:</p> <ul style="list-style-type: none"> Pin 1 (BN): Retract Pin 2 (WH): Extend <p>Voltage level</p> <ul style="list-style-type: none"> Drive: 8.0 ... 30.0 VDC* Stop: 0.0 ... 0.8 VDC* <p>*to GND (Pin 5)</p>
Pin 2 White (WH)	

Continued on next page

Continued from previous page	
Pin 3 Blue (BU)	Not connected Leave unconnected
Pin 4 Black (BK)	
Pin 5 Grey (GY)	GND of the linear drive Low-resistance GND connection of the linear drive. Do not connect to the supply voltage!

Example

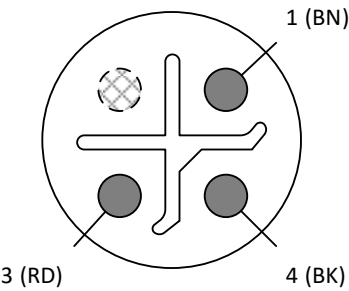
Connection example



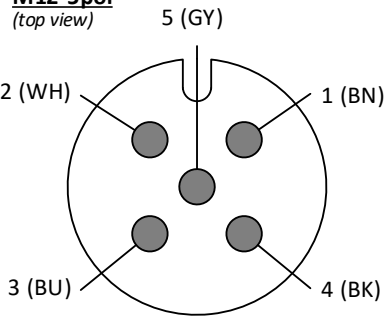
Connection plan AP.4.017717

Pin assignment

M12power
(top view)



M12-5pol
(top view)




Pin assignment M12power (3-pin)

*** Supply voltage ***

Pwr

Pin	Description	
Pin 1 Brown (BN)	Functional earth	DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).
Pin 3 Red (RD)		Connection Connect the black wire to minus (0V) and the red wire to plus. The permissible voltage can be found on the type plate.
Pin 4 Black (BK)		The brown (BN) wire is to be connected to earth.



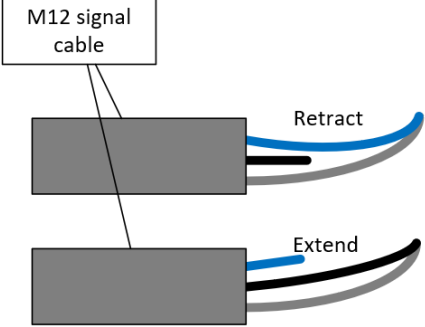
Pin assignment M12 Signal (5-pin)

*** Communication & control plug ***

In

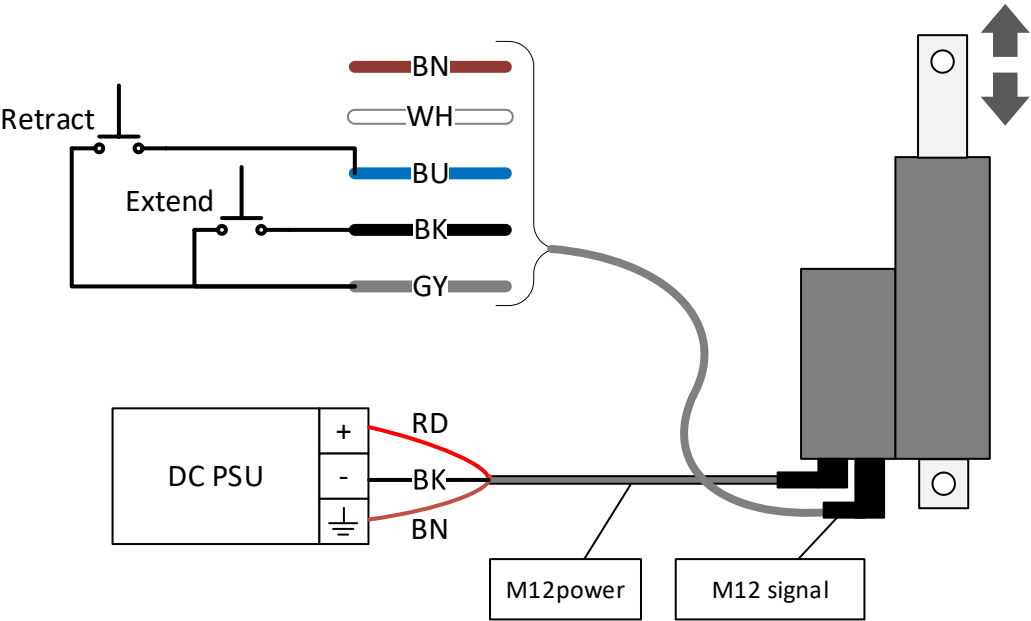
Pin	Description
Pin 1 Brown (BN)	Not connected Leave unconnected
Pin 2 White (WH)	
Continued on next page	

Continued from previous page	
Pin 3 Blue (BU)	Control Connect the black (BK) wire to the grey (GY) wire to extend the cylinder. Connect the blue (BU) wire to the gray (GY) wire to retract the cylinder. The cylinder stops automatically in the end position. <ul style="list-style-type: none">• Pin 3 (BU): Retract• Pin 4 (BK): Extend Specification <ul style="list-style-type: none">• Connected: $\leq 10\ \Omega$• Disconnected: $\geq 100k\ \Omega$
Pin 4 Black (BK)	
Pin 5 Grey (GY)	GND of the linear drive Low-resistance GND connection of the linear drive. Do not connect to the supply voltage!



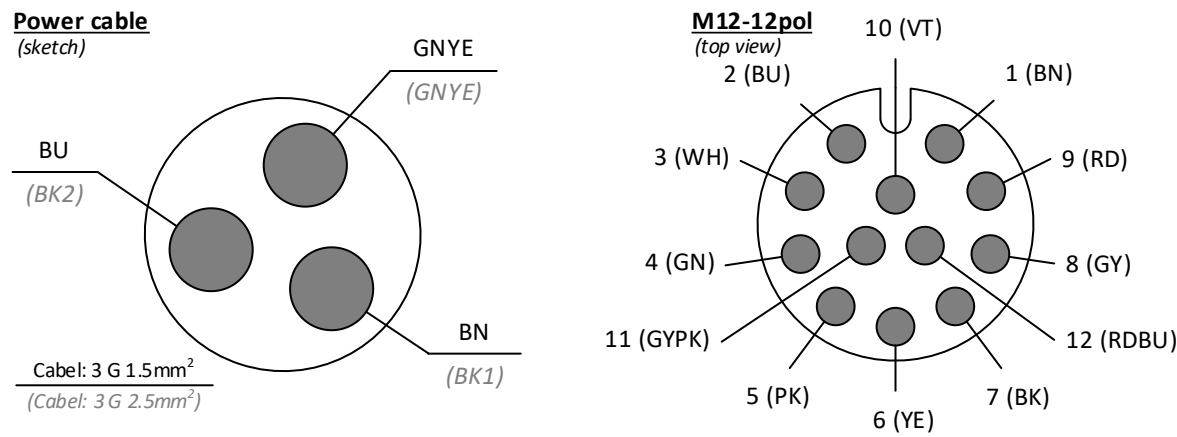
Example

Connection example



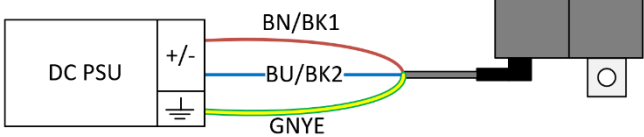
Connection plan AP.4.017718

Pin assignment



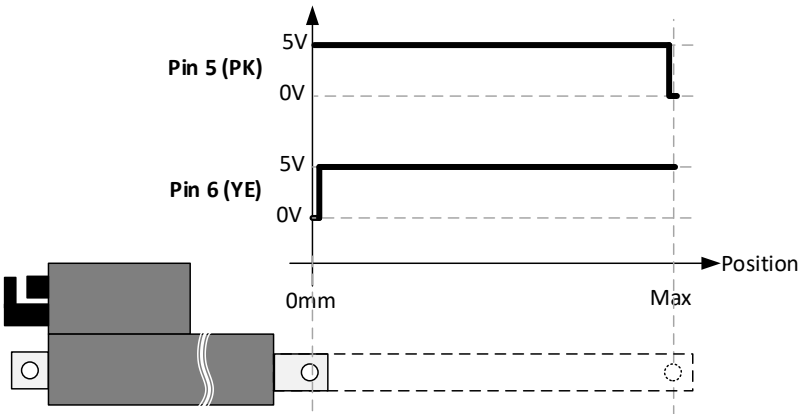
Power cable
*** Supply voltage ***

Pwr

Wire	Description																			
<div>1.5mm²: Green-Yellow (GNYE)</div> <div>2.5mm²: Green-Yellow (GNYE)</div>	Functional earth	<div>DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).</div> <div>The green-yellow (GNYE) wire is to be connected to earth.</div> <div>Control The cylinder extends or retracts according to the polarity of the power supply.</div> <div></div> <div><table><tr><th></th><th>Brown</th><th>Blue</th></tr><tr><td>Retract</td><td>Minus</td><td>Plus</td></tr><tr><td>Extend</td><td>Plus</td><td>Minus</td></tr></table> <table><tr><th></th><th>BK1</th><th>BK2</th></tr><tr><td>Retract</td><td>Minus</td><td>Plus</td></tr><tr><td>Extend</td><td>Plus</td><td>Minus</td></tr></table></div>		Brown	Blue	Retract	Minus	Plus	Extend	Plus	Minus		BK1	BK2	Retract	Minus	Plus	Extend	Plus	Minus
	Brown	Blue																		
Retract	Minus	Plus																		
Extend	Plus	Minus																		
	BK1	BK2																		
Retract	Minus	Plus																		
Extend	Plus	Minus																		
<div>1.5mm²: Brown (BN)</div> <div>2.5mm²: Black 1 (BK1)</div>	DC power supply																			
<div>1.5mm²: Blue (BU)</div> <div>2.5mm²: Black 2 (BK2)</div>																				

Pin assignment M12 Signal (12-pin)
 *** Communication & control plug ***

In

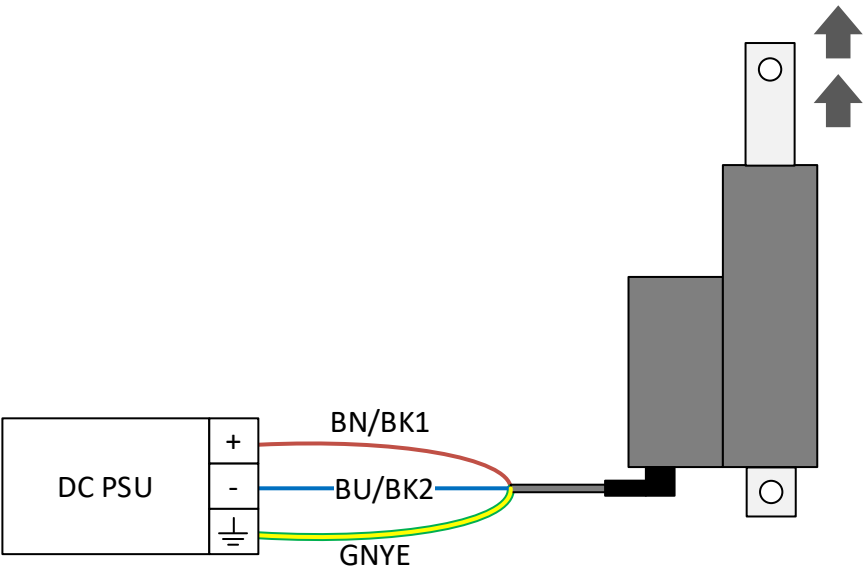
Pin	Description	
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power. Do not connect to the supply voltage!	
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected	
Pin 3 White (WH)	Not connected Leave unconnected	
Pin 4 Green (GN)		
Pin 5 Pink (PK)	End position signal Extended	End position signal The cylinder indicates when the retracted and extended end positions are reached with a separate pin each via a 5V signal. This enables your control system to determine the end position of the cylinder without the need for external sensors. Level definitions* <ul style="list-style-type: none"> End position reached: approx. 0.0V Any middle position: approx. 5.0V Interface specification* <ul style="list-style-type: none"> Load R_L $\geq 10k\ \Omega$ High level <small>without any load</small> 4.8 ... 5.2 V High level <small>with R_L</small> $\geq 4.0\ V$ Low level $\leq 0.2\ V$ <div>  </div> <p><small>*with respect to GND (pin 1)</small></p>
Pin 6 Yellow (YE)	End position signal Retracted	

Continued on next page

Continued from previous page	
Pin 7 Black (BK)	Not connected Leave unconnected
Pin 8 Grey (GY)	
Pin 9 Red (RD)	
Pin 10 Violet (VT)	
Pin 11 Gray-Pink (GYPK)	
Pin 12 Red-Blue (RDBU)	

Example

Connection example – Extend

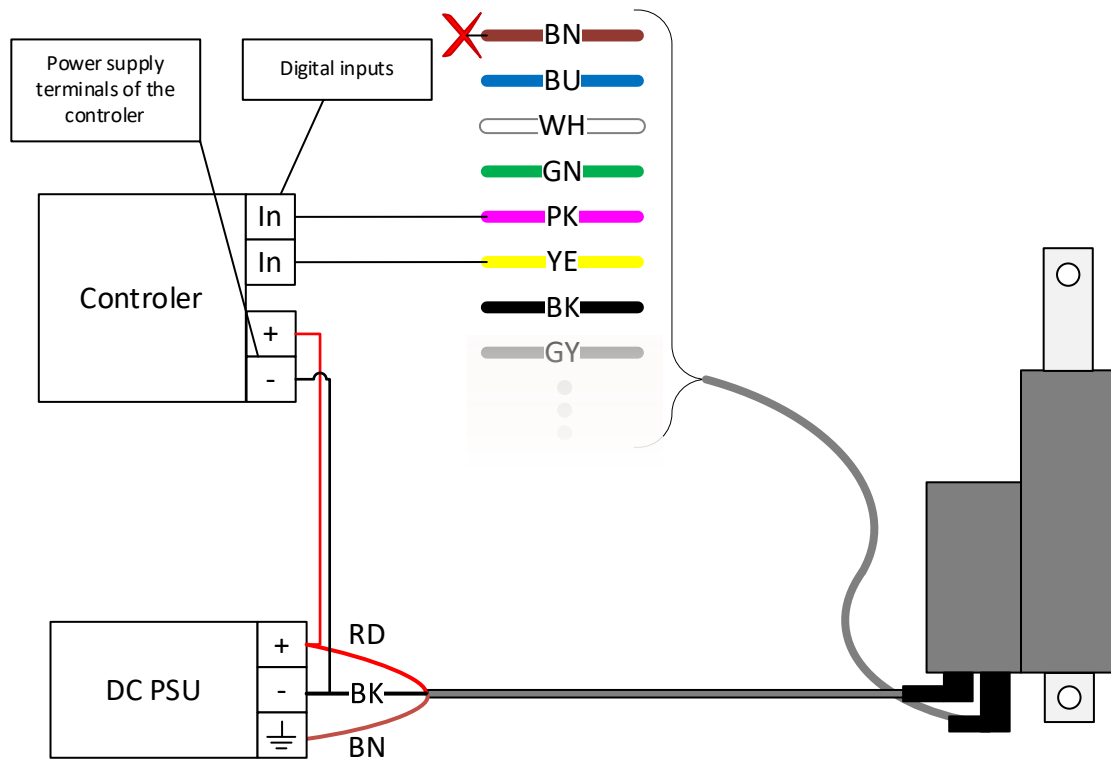


The diagram shows a DC PSU connected to a motor assembly. The PSU has three terminals: a positive terminal (+), a negative terminal (-), and a ground terminal (indicated by a ground symbol). The positive terminal is connected to a red wire labeled "BN/BK1". The negative terminal is connected to a blue wire labeled "BU/BK2". The ground terminal is connected to a green wire labeled "GNYE". The motor assembly consists of a grey rectangular block with a black base. A black cable connects the blue wire "BU/BK2" to the black base of the motor assembly. Above the motor assembly, there are two vertical grey rectangular blocks, one of which has a small circle at the top. Two black arrows point upwards from the top of the motor assembly.

The diagram illustrates a battery-powered motor control system. The power source is a battery (BT1) with terminals Pwr+ and Pwr-. A fuse (F1) is connected in series with the Pwr+ line. The Pwr- line is connected to a fast stop circuit (R1) and a relay (K1) for start/stop control. The relay (K2) controls the motor direction. The motor is connected to the relay outputs (BN/BK1, BU/BK2) and a ground connection (GNYE). The motor is shown with a vertical shaft and a double-headed arrow indicating rotation.

AP.4.017718
Version 1.2

Connection example – Feedback signal

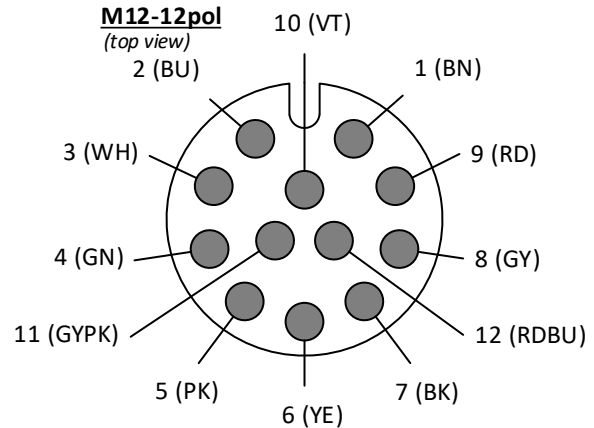
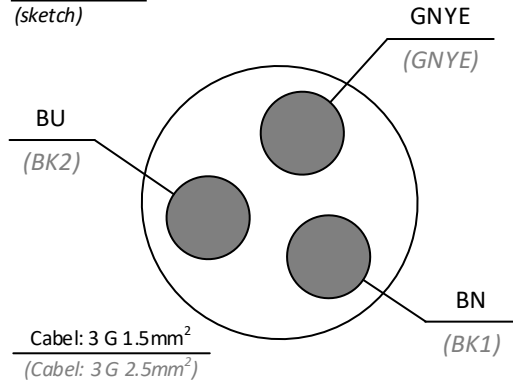


Note: The figure shows a common application in which the control unit is connected to a central GND (minus), such as the cylinder. The brown wire (GND) of the 12-pole cable must not be connected in this constellation.

Connection plan AP.4.017719

Pin assignment

Power cable
(sketch)



Power cable

*** Supply voltage ***

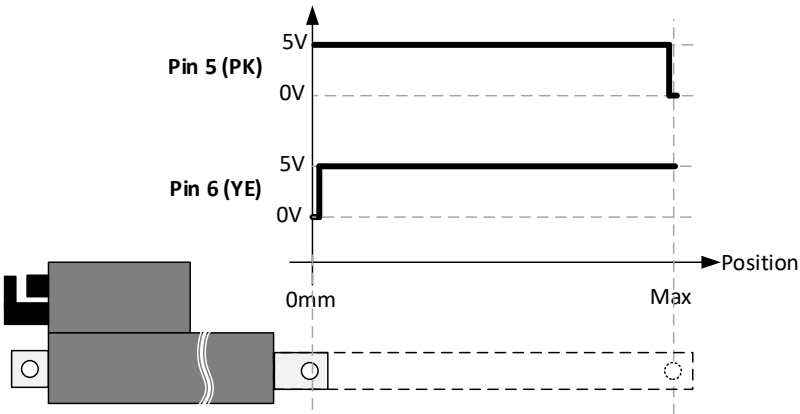
Pwr

Wire	Description
1.5mm ² : Green-Yellow (GNYE) 2.5mm ² : Green-Yellow (GNYE)	Functional earth DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). Wiring with 1.5mm² Connect the blue wire to minus (0V) and the brown wire to plus. The permissible voltage can be taken from the type plate.
1.5mm ² : Brown (BN) 2.5mm ² : Black 1 (BK1)	DC power supply
1.5mm ² : Blue (BU) 2.5mm ² : Black 2 (BK2)	Wiring with 2.5mm² Connect black wire 2 (BK2) to minus (0V) and black wire 1 (BK1) to plus. The permissible voltage can be taken from the type plate. General The green-yellow (GNYE) wire is to be connected to the ground.

Pin assignment M12 Signal (12-pin)

*** Communication & control plug ***

In

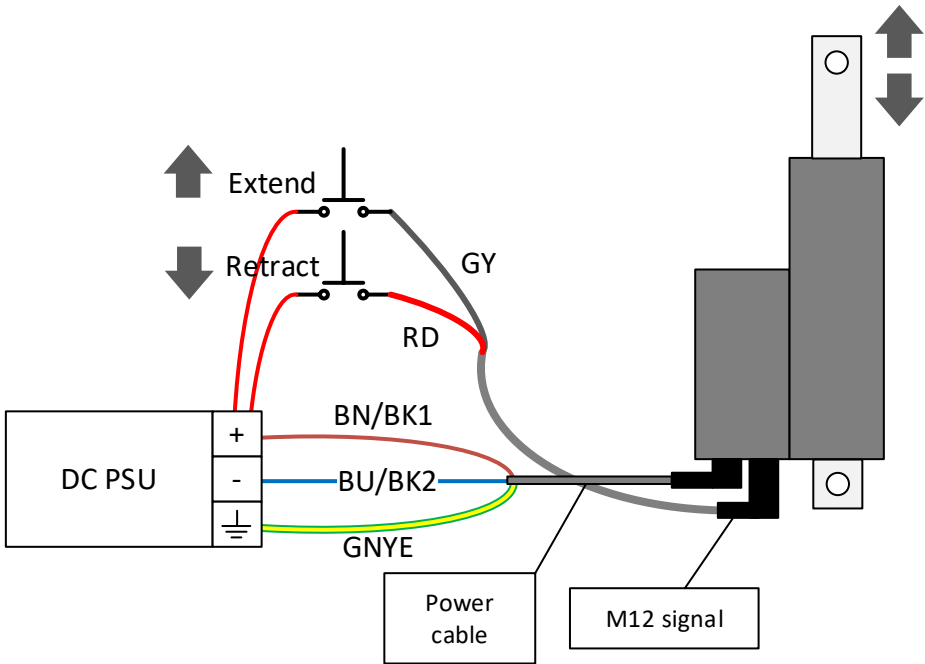
Pin	Description	
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power. Do not connect to the supply voltage!	
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected	
Pin 3 White (WH)	Not connected Leave unconnected	
Pin 4 Green (GN)		
Pin 5 Pink (PK)	End position signal Extended	End position signal The cylinder indicates when the retracted and extended end positions are reached with a separate pin each via a 5V signal. This enables your control system to determine the end position of the cylinder without the need for external sensors. Level definitions* <ul style="list-style-type: none">End position reached: approx. 0.0VAny middle position: approx. 5.0V Interface specification* <ul style="list-style-type: none">Load R_L $\geq 10k\ \Omega$High level <small>without any load</small> 4.8 ... 5.2 VHigh level <small>with R_L</small> $\geq 4.0\ V$Low level $\leq 0.2\ V$ <div></div> <p>*with respect to GND (pin 1)</p>
Pin 6 Yellow (YE)	End position signal Retracted	

Continued on next page

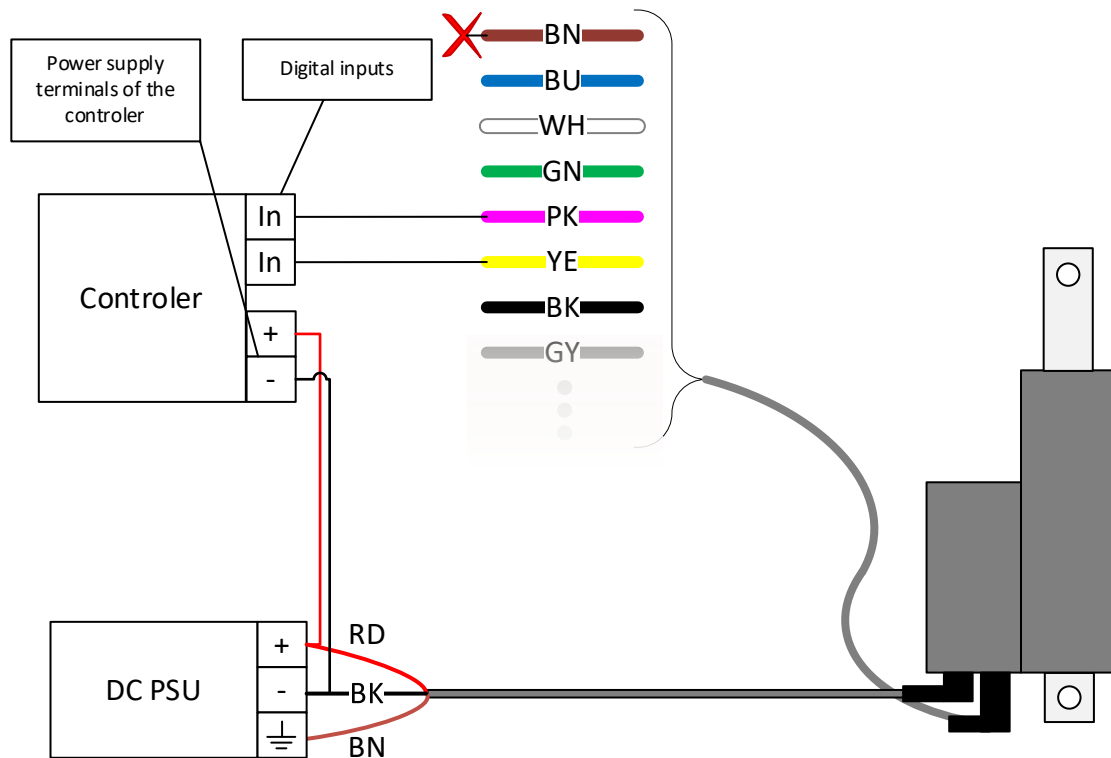
Continued from previous page	
Pin 7 Black (BK)	Not connected Leave unconnected
Pin 8 Grey (GY)	Control You can retract and extend the cylinder via the two wires. By applying a voltage, for example the supply voltage of the cylinder, to the red wire (pin 9), the cylinder retracts. The definition of the wires is as follows: <ul style="list-style-type: none"> Pin 8 (GY): Extend Pin 9 (RD): Retract Voltage level <ul style="list-style-type: none"> Drive: 8.0 ... 30.0 VDC* Stop: 0.0 ... 0.8 VDC* *with respect to GND (pin 1)
Pin 9 Red (RD)	
Pin 10 Violet (VT)	
Pin 11 Gray-Pink (GYPK)	Not connected Leave unconnected
Pin 12 Red-Blue (RDBU)	

Example

Connection example – drive



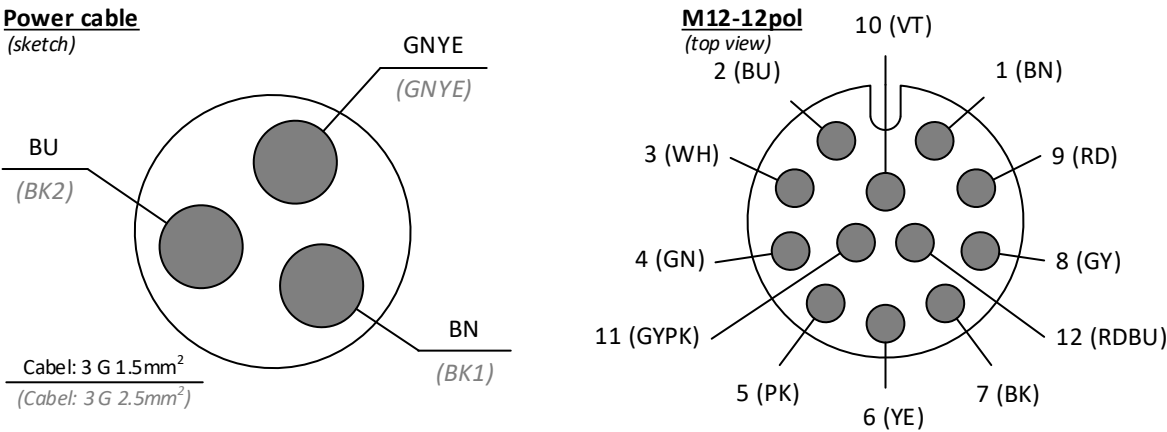
Connection example – Feedback signal



Note: The figure shows a common application in which the control unit is connected to a central GND (minus), such as the cylinder. The brown wire (GND) of the 12-pole cable must not be connected in this constellation.

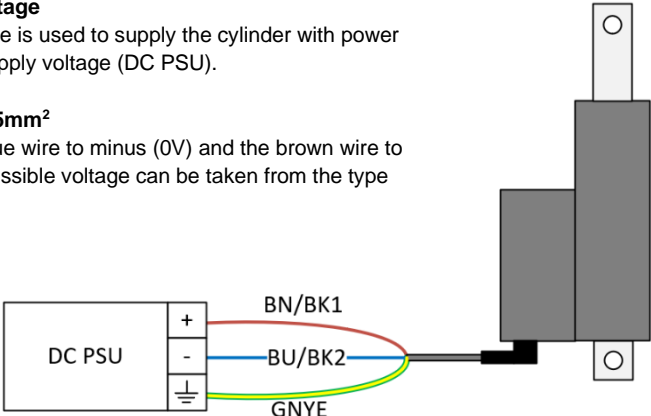
Connection plan AP.4.017720

Pin assignment



Power cable
*** Supply voltage ***

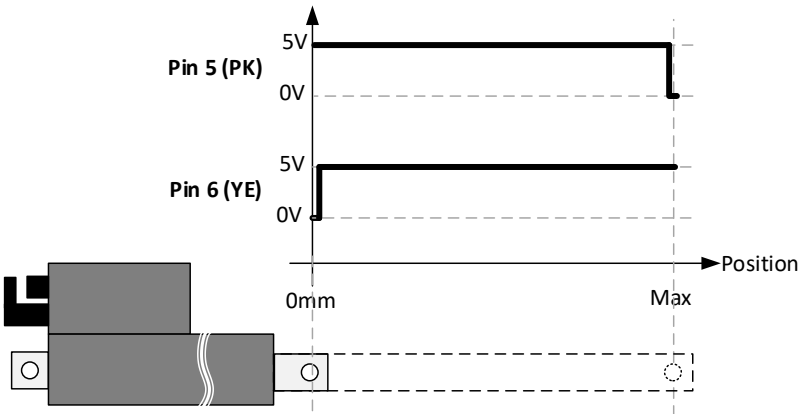
Pwr

Wire	Description	
1.5mm ² : Green-Yellow (GNYE) 2.5mm ² : Green-Yellow (GNYE)	Functional earth	DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). Wiring with 1.5mm² Connect the blue wire to minus (0V) and the brown wire to plus. The permissible voltage can be taken from the type plate.  Wiring with 2.5mm² Connect black wire 2 (BK2) to minus (0V) and black wire 1 (BK1) to plus. The permissible voltage can be taken from the type plate. General The green-yellow (GNYE) wire is to be connected to the ground.
1.5mm ² : Brown (BN) 2.5mm ² : Black 1 (BK1)	DC power supply	
1.5mm ² : Blue (BU) 2.5mm ² : Black 2 (BK2)		

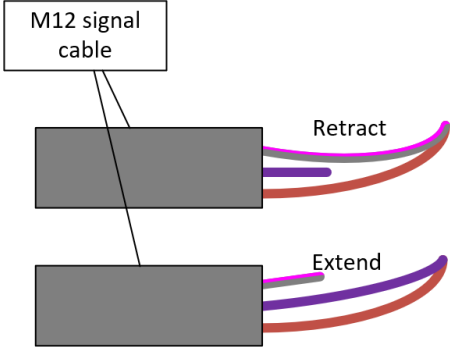
Pin assignment M12 Signal (12-pin)

*** Communication & control plug ***

In

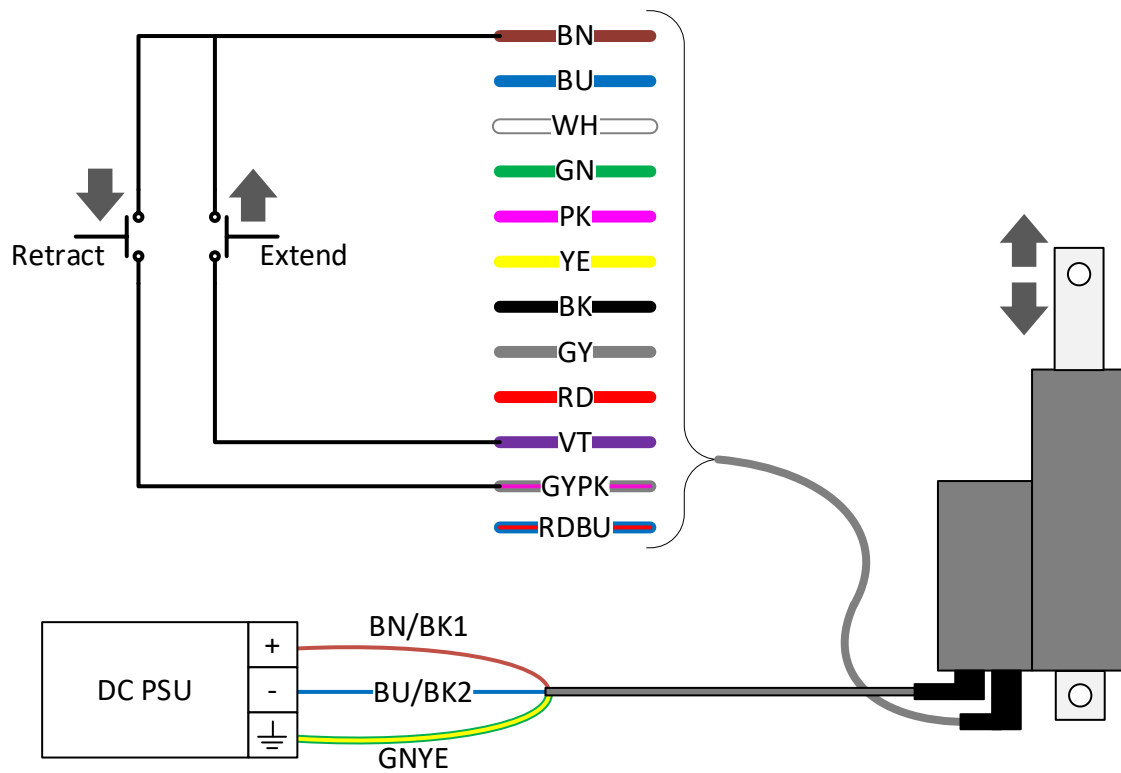
Pin	Description	
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power. Do not connect to the supply voltage!	
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected	
Pin 3 White (WH)	Not connected Leave unconnected	
Pin 4 Green (GN)		
Pin 5 Pink (PK)	End position signal Extended	End position signal The cylinder indicates when the retracted and extended end positions are reached with a separate pin each via a 5V signal. This enables your control system to determine the end position of the cylinder without the need for external sensors. Level definitions* <ul style="list-style-type: none">End position reached: approx. 0.0VAny middle position: approx. 5.0V Interface specification* <ul style="list-style-type: none">Load R_L $\geq 10k\ \Omega$High level <small>without any load</small> 4.8 ... 5.2 VHigh level <small>with R_L</small> $\geq 4.0\ V$Low level $\leq 0.2\ V$ <div></div> <p>*with respect to GND (pin 1)</p>
Pin 6 Yellow (YE)	End position signal Retracted	

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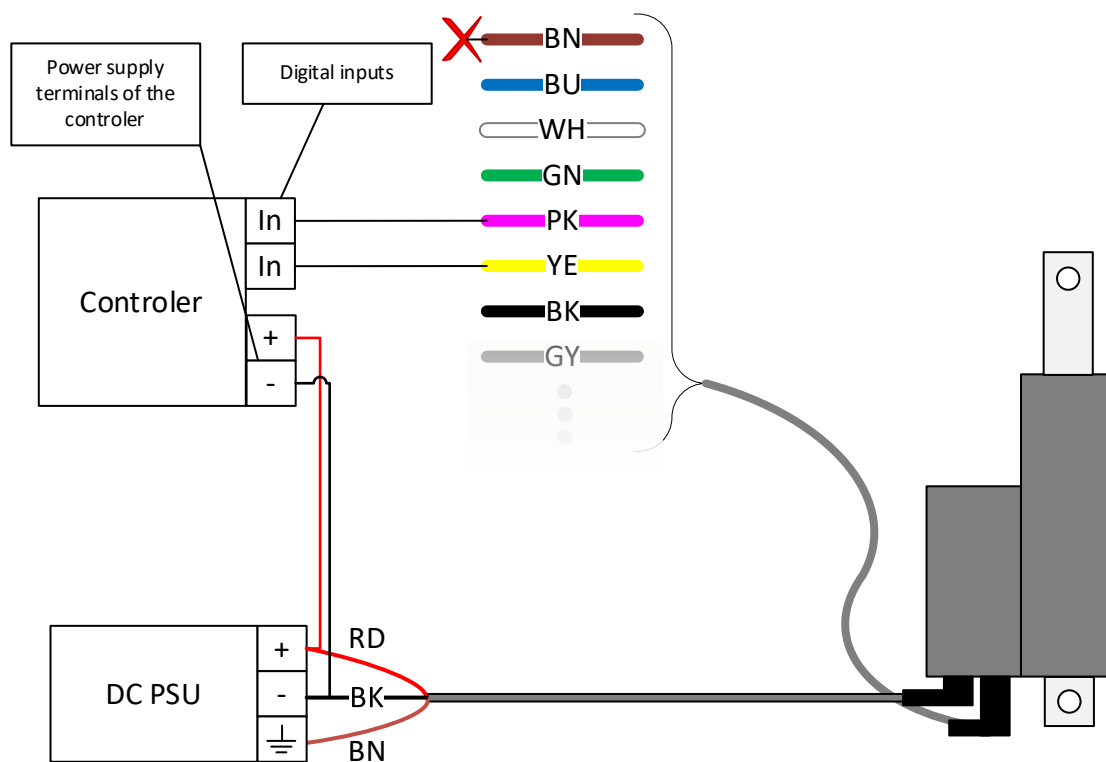
Continued from previous page	
Pin 7 Black (BK)	Not connected Leave unconnected
Pin 8 Grey (GY)	
Pin 9 Red (RD)	
Pin 10 Violet (VT)	Control Connect the violette (VT) wire to the brown (BN) wire to extend the cylinder. Connect the gray-pink (GYPK) wire to the brown (BN) wire to retract the cylinder. The cylinder stops automatically in the end position. <ul style="list-style-type: none">Pin 10 (V): ExtendPin 11 (GYPK): Retract <u>Specification</u> <ul style="list-style-type: none">Connected: $\leq 10\ \Omega$Disconnected: $\geq 100k\ \Omega$ <div></div>
Pin 11 Gray-Pink (GYPK)	
Pin 12 Red-Blue (RDBU)	Not connected Leave unconnected

Example

Connection example – drive



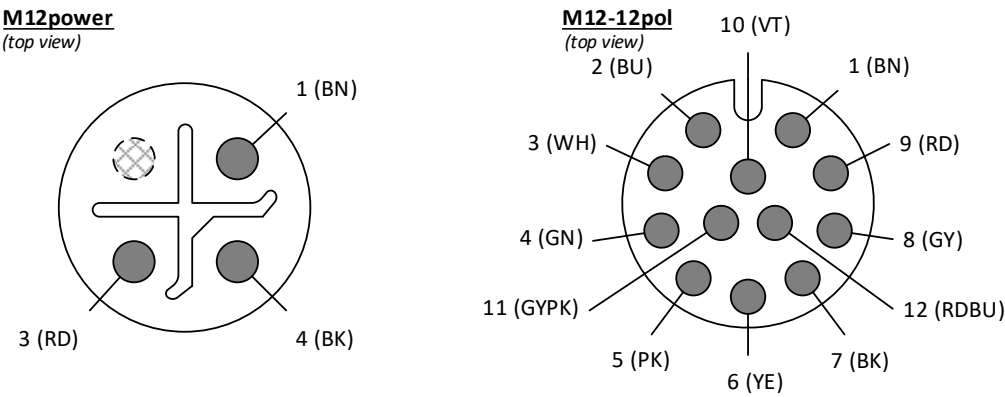
Connection example – Feedback signal



Note: The figure shows a common application in which the control unit is connected to a central GND (minus), such as the cylinder. The brown wire (GND) of the 12-pole cable must not be connected in this constellation.

Connection plan AP.4.017721

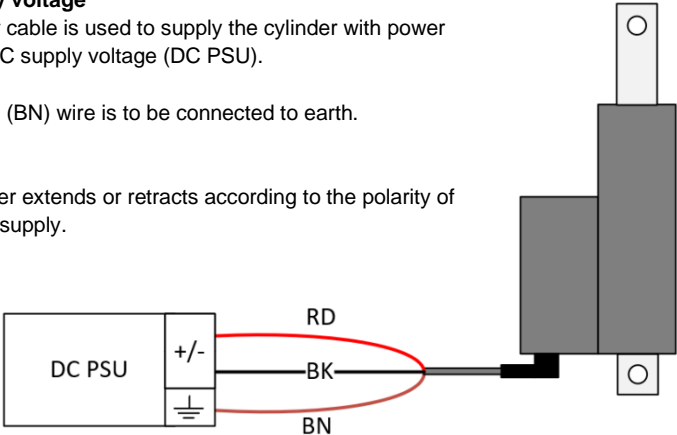
Pin assignment



Pin assignment M12power (3-pin)

*** Supply voltage ***

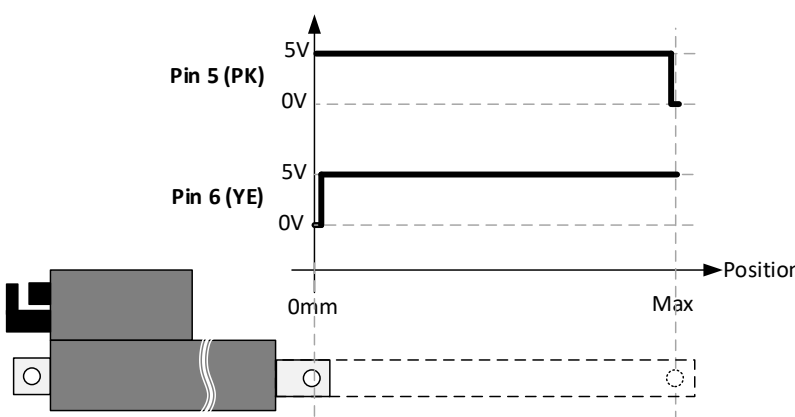
Pwr

Pin	Description	
Pin 1 Brown (BN)	Functional earth DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). The brown (BN) wire is to be connected to earth. Control The cylinder extends or retracts according to the polarity of the power supply.	
Pin 3 Red (RD)		
Pin 4 Black (BK)		

	Red	Black
Retract	Minus	Plus
Extend	Plus	Minus

Pin assignment M12 Signal (12-pin)
*** Communication & control plug ***

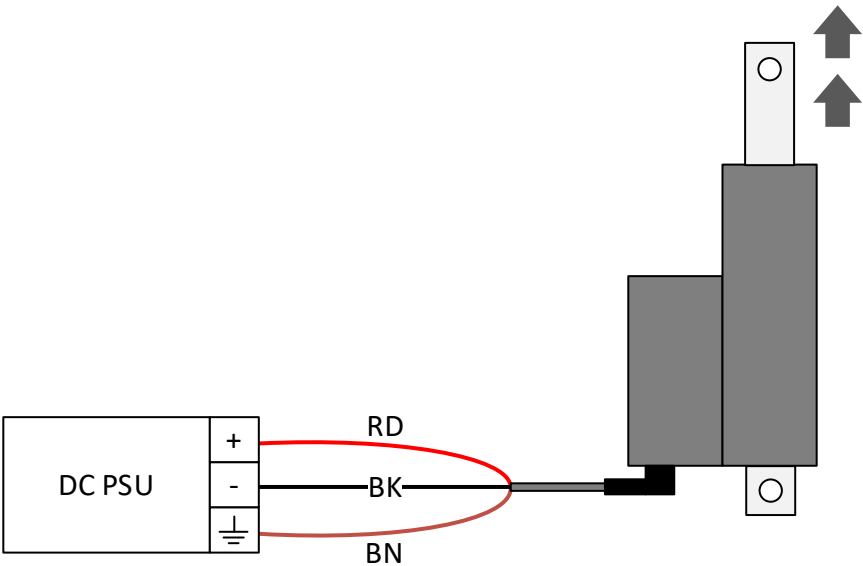
In

Pin	Description	
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Use this pin only if you want to connect a galvanically isolated interface to pin 5 and/or pin 6. Do not connect to the supply voltage!	
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected	
Pin 3 White (WH)	Not connected Leave unconnected	
Pin 4 Green (GN)		
Pin 5 Pink (PK)	End position signal Extended	End position signal The cylinder indicates when the retracted and extended end positions are reached with a separate pin each via a 5V signal. This enables your control system to determine the end position of the cylinder without the need for external sensors.
Pin 6 Yellow (YE)	End position signal Retracted	Level definitions* <ul style="list-style-type: none">• End position reached: approx. 0.0V• Any middle position: approx. 5.0V Interface specification* <ul style="list-style-type: none">• Load R_L $\geq 10k\ \Omega$• High level without any load 4.8 ... 5.2 V• High level with R_L $\geq 4.0\ V$• Low level $\leq 0.2\ V$  <small>*with respect to GND (pin 1)</small>
Continued on next page		

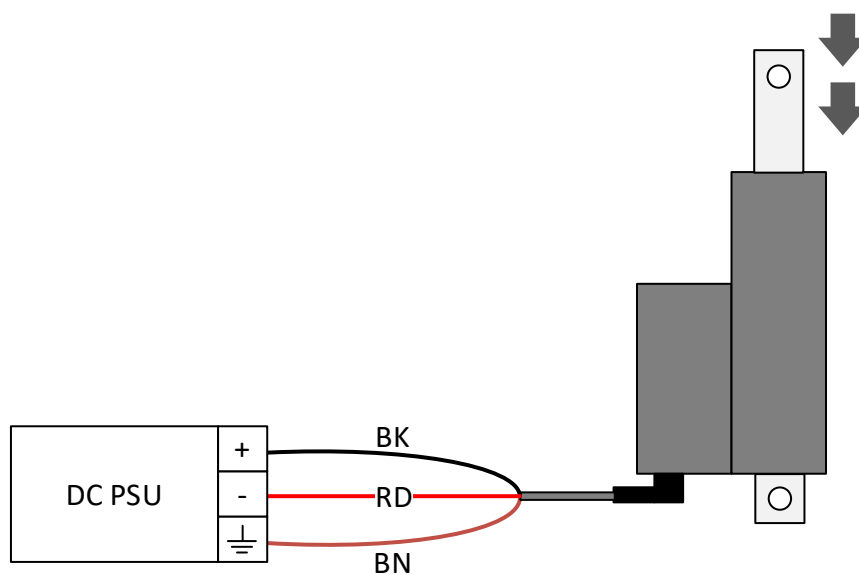
Continued from previous page	
Pin 7 Black (BK)	Not connected Leave unconnected
Pin 8 Grey (GY)	
Pin 9 Red (RD)	
Pin 10 Violet (VT)	
Pin 11 Gray-Pink (GYPK)	
Pin 12 Red-Blue (RDBU)	

Example

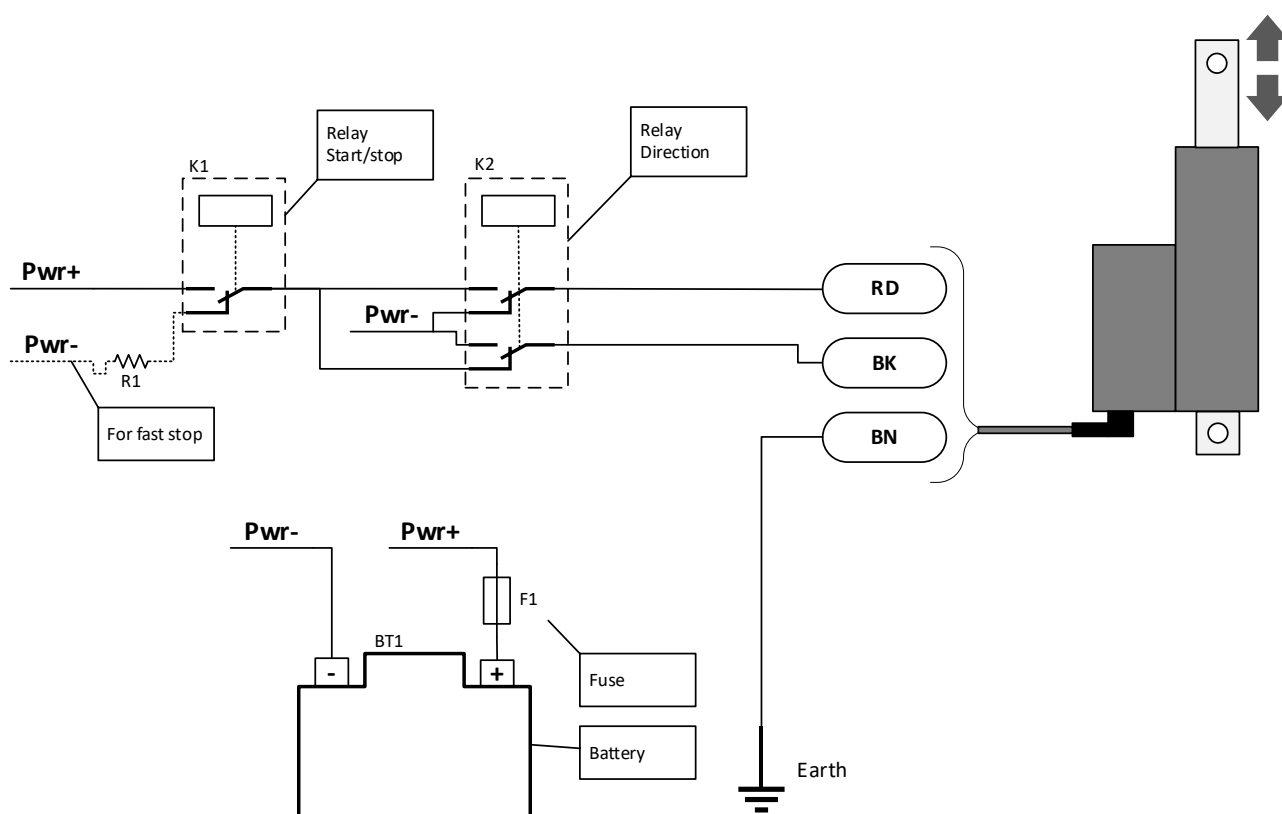
Connection example – Extend



Connection example – Retract

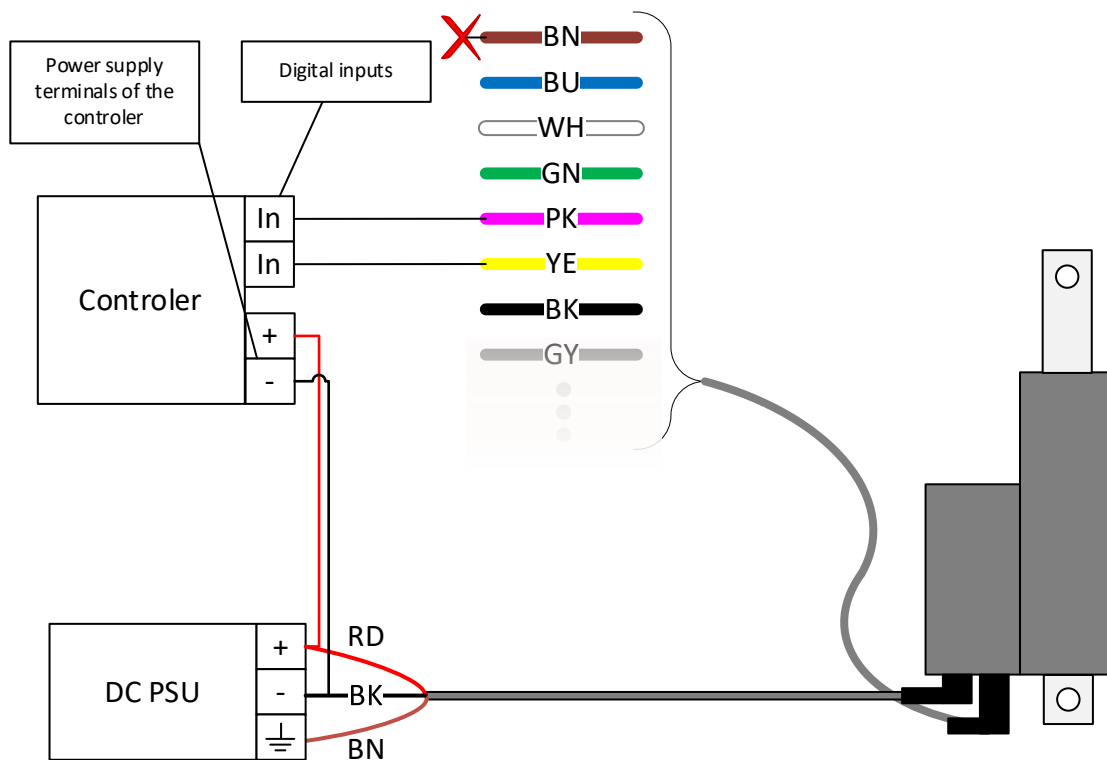


Control example - relay



Note: Do not change the direction during the drive. Always stop the motion via relay K1 before changing the direction with K2.

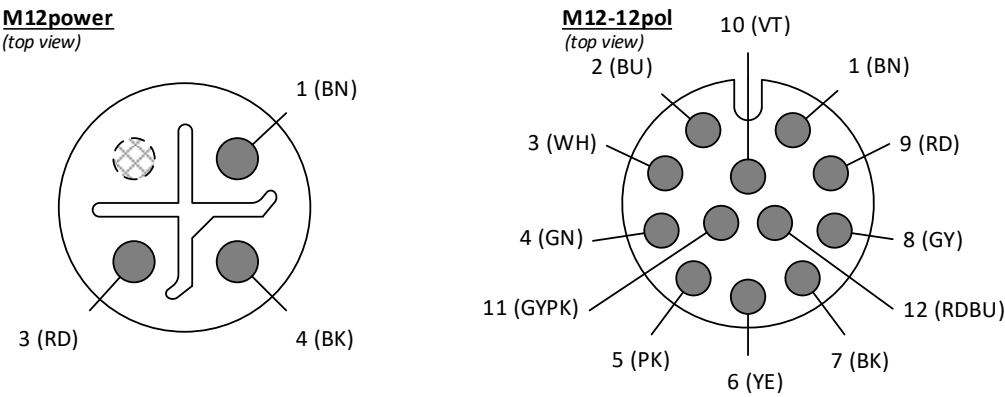
Connection example – Feedback signal



Note: The figure shows a common application in which the control unit is connected to a central GND (minus), such as the cylinder. The brown wire (GND) of the 12-pole cable must not be connected in this constellation.

Connection plan AP.4.017722

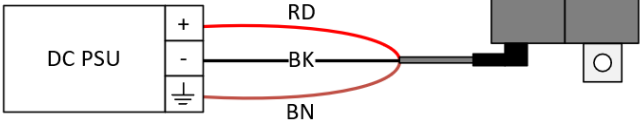
Pin assignment



Pin assignment M12power (3-pin)

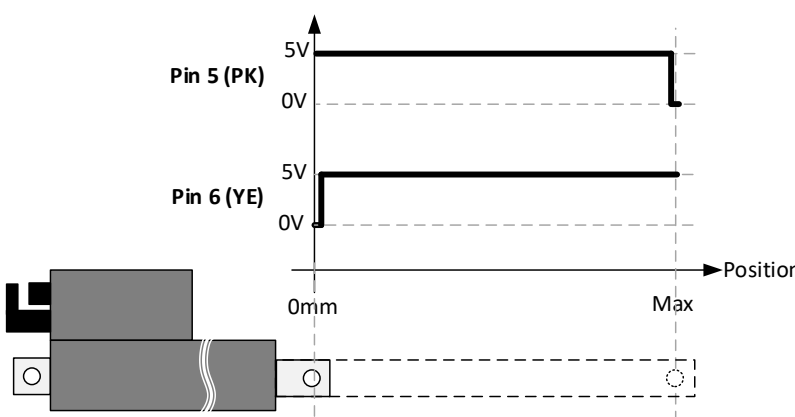
*** Supply voltage ***

Pwr

Pin	Description	
Pin 1 Brown (BN)	Functional earth	DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). Connection Connect the black wire to minus (0V) and the red wire to plus. The permissible voltage can be found on the type plate. The brown (BN) wire is to be connected to earth. 
Pin 3 Red (RD)		
Pin 4 Black (BK)		

Pin assignment M12 Signal (12-pin)
*** Communication & control plug ***

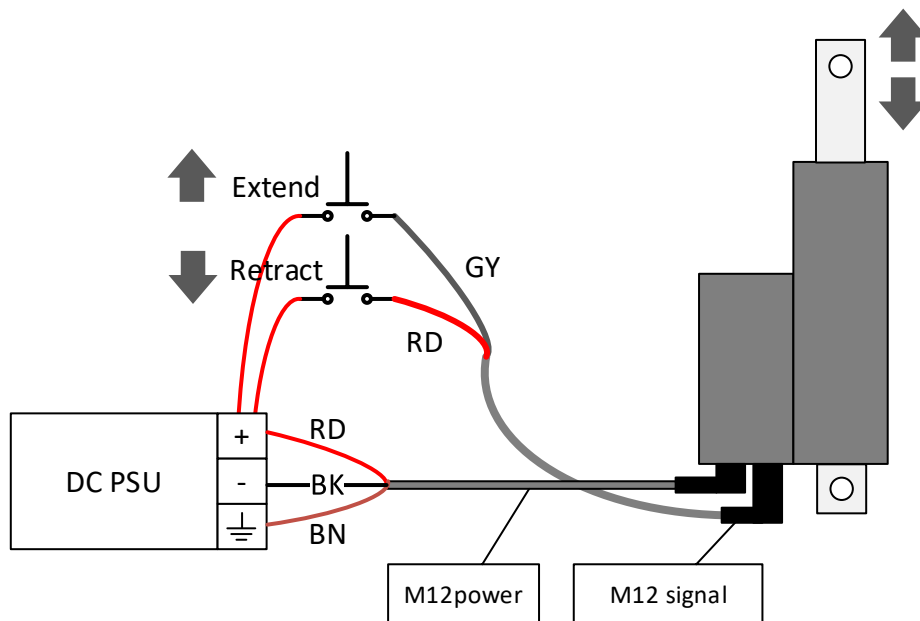
In

Pin	Description	
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power. Do not connect to the supply voltage!	
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected	
Pin 3 White (WH)	Not connected Leave unconnected	
Pin 4 Green (GN)		
Pin 5 Pink (PK)	End position signal Extended	End position signal The cylinder indicates when the retracted and extended end positions are reached with a separate pin each via a 5V signal. This enables your control system to determine the end position of the cylinder without the need for external sensors.
Pin 6 Yellow (YE)	End position signal Retracted	Level definitions* <ul style="list-style-type: none">End position reached: approx. 0.0VAny middle position: approx. 5.0V Interface specification* <ul style="list-style-type: none">Load R_L $\geq 10k\ \Omega$High level <small>without any load</small> 4.8 ... 5.2 VHigh level <small>with R_L</small> $\geq 4.0\ V$Low level $\leq 0.2\ V$ <div></div> <p>*with respect to GND (pin 1)</p>
Continued on next page		

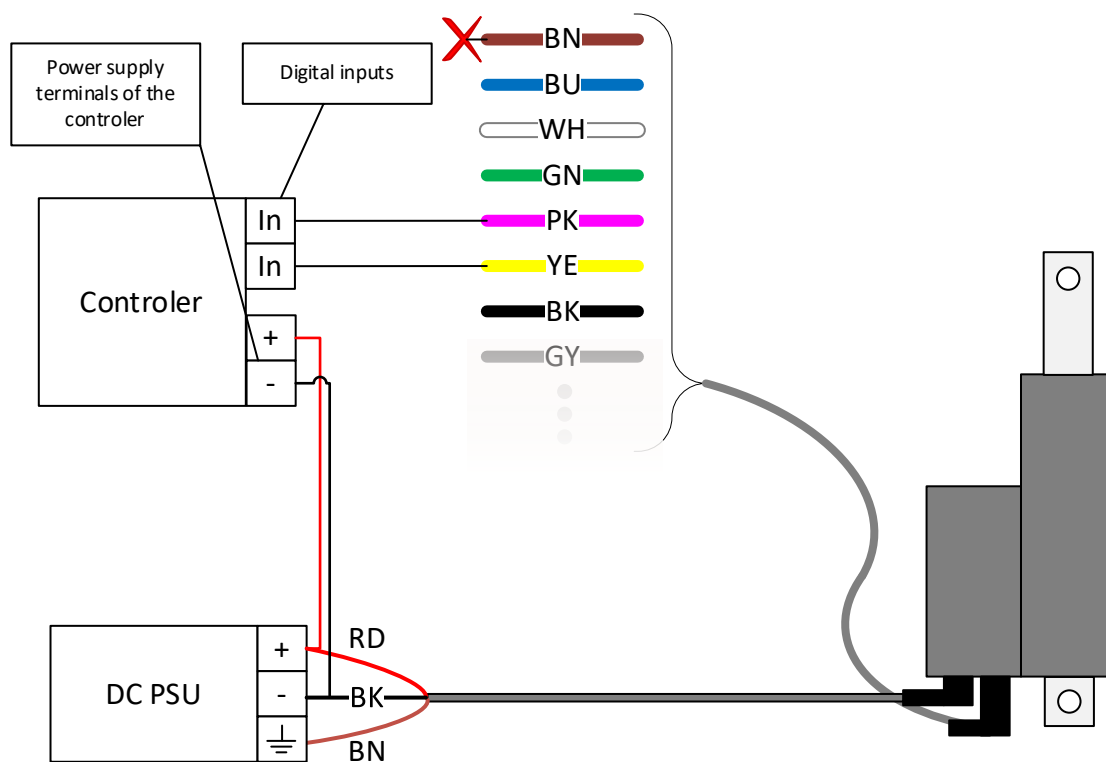
Continued from previous page	
Pin 7 Black (BK)	Not connected Leave unconnected
Pin 8 Grey (GY)	Control You can retract and extend the cylinder via the two wires. By applying a voltage, for example the supply voltage of the cylinder, to the red wire (pin 9), the cylinder retracts. The definition of the wires is as follows: <ul style="list-style-type: none"> Pin 8 (GY): Extend Pin 9 (RD): Retract Voltage level <ul style="list-style-type: none"> Drive: 8.0 ... 30.0 VDC* Stop: 0.0 ... 0.8 VDC* *with respect to GND (pin 1)
Pin 9 Red (RD)	
Pin 10 Violet (VT)	
Pin 11 Gray-Pink (GYPK)	
Pin 12 Red-Blue (RDBU)	

Example

Connection example – drive



Connection example – Feedback signal

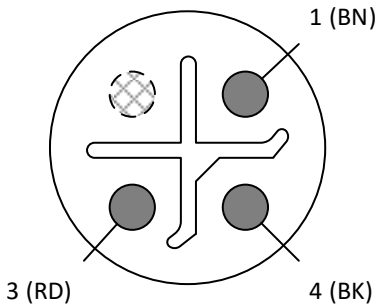


Note: The figure shows a common application in which the control unit is connected to a central GND (minus), such as the cylinder. The brown wire (GND) of the 12-pole cable must not be connected in this constellation.

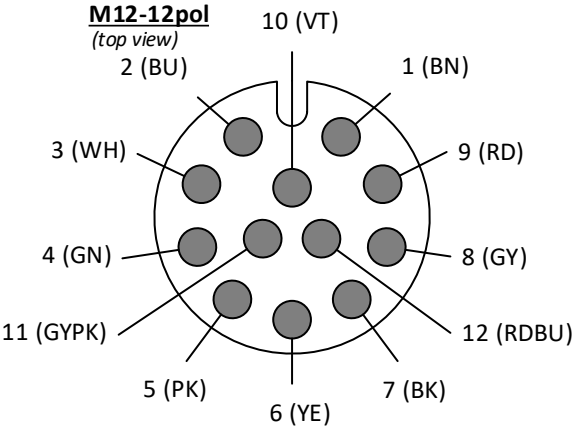
Connection plan AP.4.017723

Pin assignment

M12power
(top view)

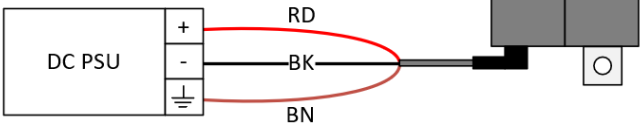


M12-12pol
(top view)



Pin assignment M12power (3-pin)
*** Supply voltage ***

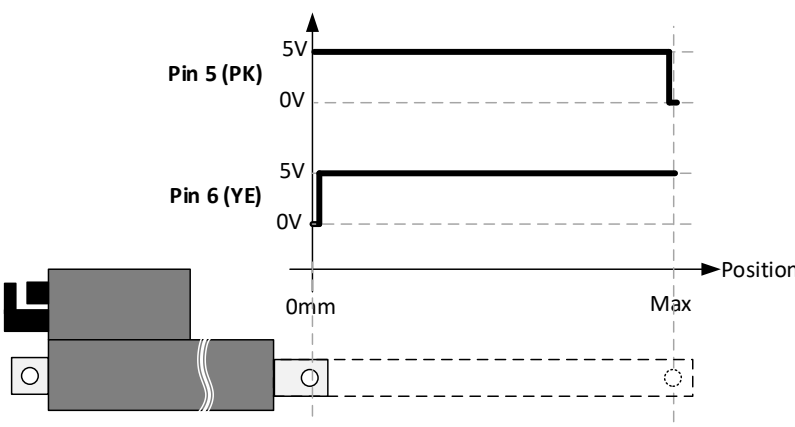
Pwr

Pin	Description	
Pin 1 Brown (BN)	Functional earth	<div>DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).</div> <div>Connection Connect the black wire to minus (0V) and the red wire to plus. The permissible voltage can be found on the type plate.</div> <div>The brown (BN) wire is to be connected to earth.</div> <div></div>
Pin 3 Red (RD)	DC power supply	
Pin 4 Black (BK)		

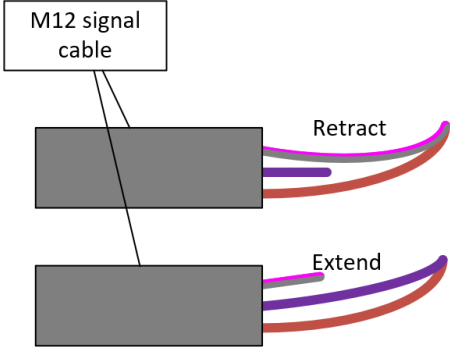
Pin assignment M12 Signal (12-pin)

*** **Communication & control plug** ***

In

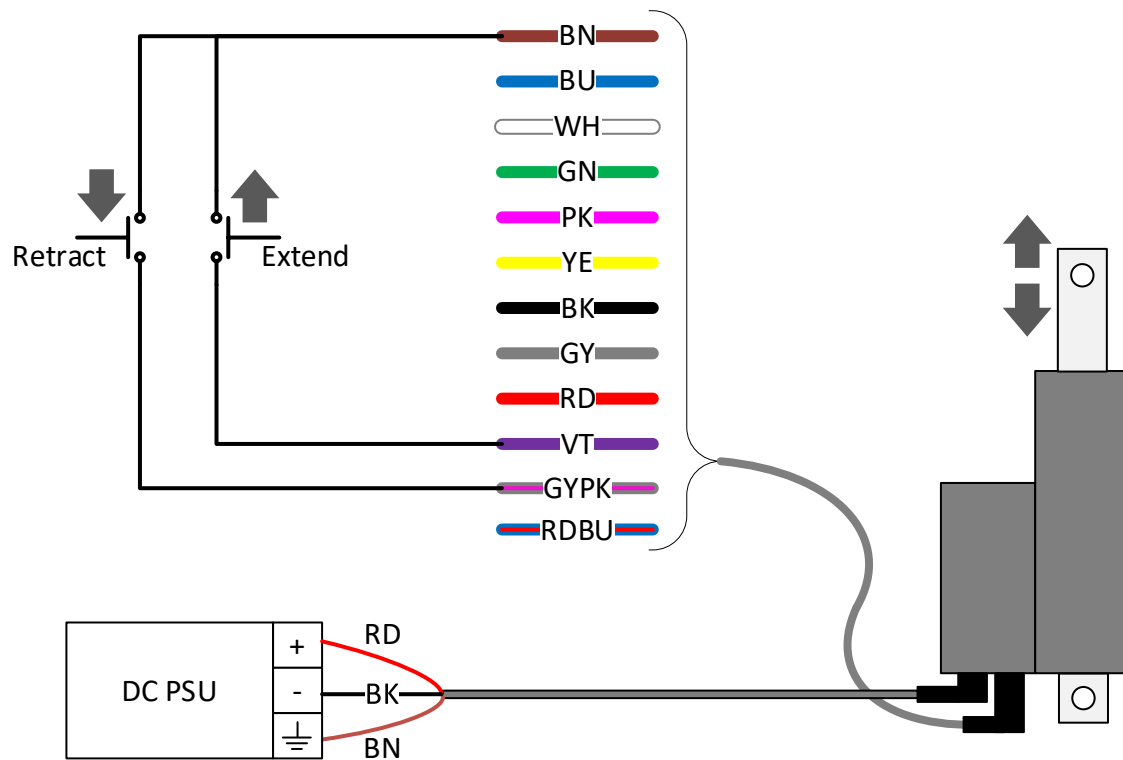
Pin	Description	
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power. Do not connect to the supply voltage!	
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected	
Pin 3 White (WH)	Not connected Leave unconnected	
Pin 4 Green (GN)		
Pin 5 Pink (PK)	End position signal Extended	End position signal The cylinder indicates when the retracted and extended end positions are reached with a separate pin each via a 5V signal. This enables your control system to determine the end position of the cylinder without the need for external sensors. Level definitions* <ul style="list-style-type: none"> End position reached: approx. 0.0V Any middle position: approx. 5.0V Interface specification* <ul style="list-style-type: none"> Load R_L $\geq 10k\ \Omega$ High level without any load 4.8 ... 5.2 V High level with R_L $\geq 4.0\ V$ Low level $\leq 0.2\ V$  <p>*with respect to GND (pin 1)</p>
Pin 6 Yellow (YE)	End position signal Retracted	

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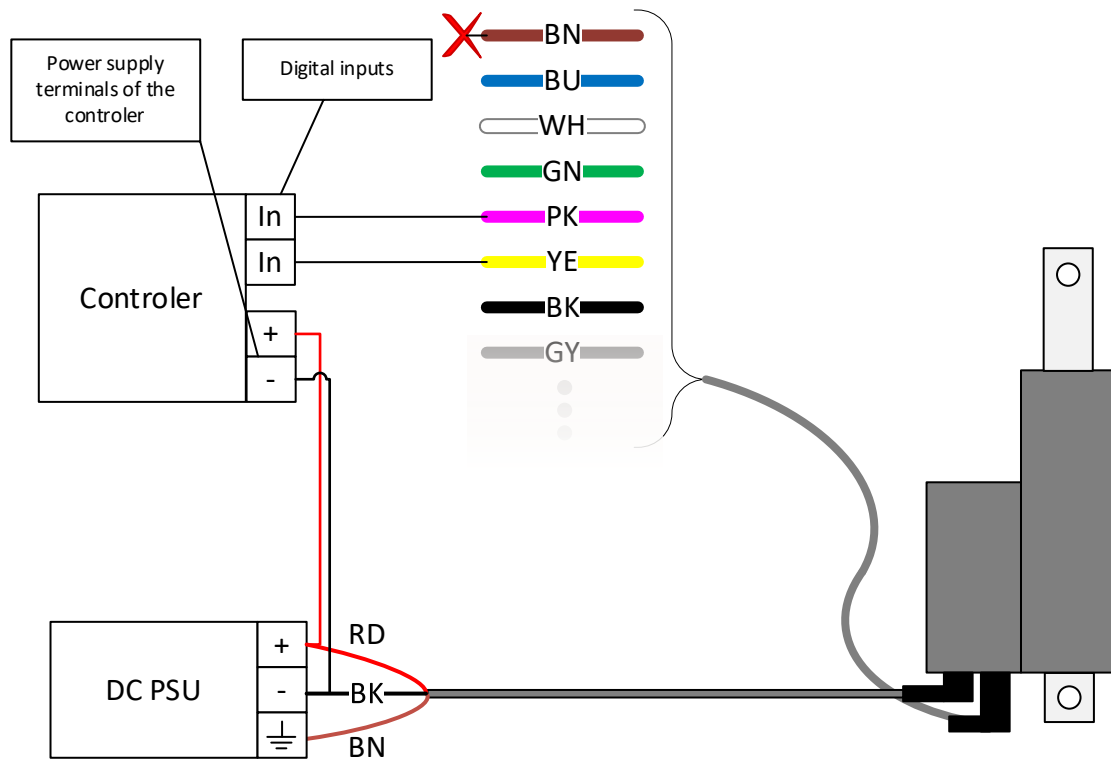
Continued from previous page	
Pin 7 Black (BK)	Not connected Leave unconnected
Pin 8 Grey (GY)	
Pin 9 Red (RD)	
Pin 10 Violet (VT)	Control Connect the violette (VT) wire to the brown (BN) wire to extend the cylinder. Connect the gray-pink (GYPK) wire to the brown (BN) wire to retract the cylinder. The cylinder stops automatically in the end position. <ul style="list-style-type: none">Pin 10 (V): ExtendPin 11 (GYPK): Retract <u>Specification</u> <ul style="list-style-type: none">Connected: $\leq 10\ \Omega$Disconnected: $\geq 100k\ \Omega$ <div></div>
Pin 11 Gray-Pink (GYPK)	
Pin 12 Red-Blue (RDBU)	Not connected Leave unconnected

Example

Connection example – drive



Connection example – Feedback signal

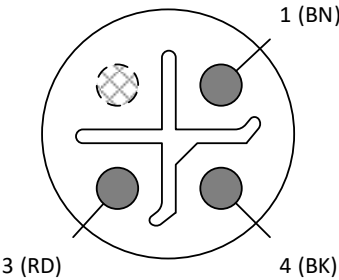


Note: The figure shows a common application in which the control unit is connected to a central GND (minus), such as the cylinder. The brown wire (GND) of the 12-pole cable must not be connected in this constellation.

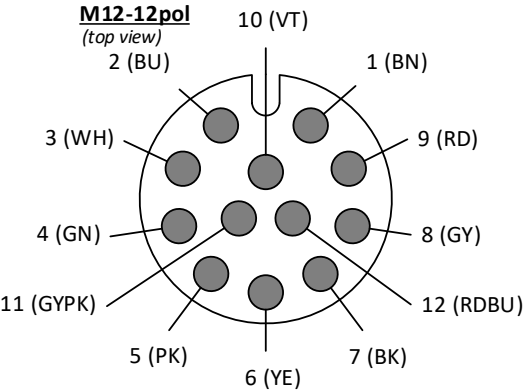
Connection plan AP.4.017808

Cable

M12power
(top view)



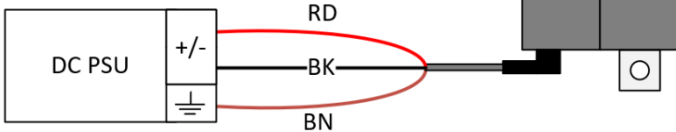
M12-12pol
(top view)



Pin assignment M12power (3-pin)

*** Supply voltage ***

Pwr

Pin	Description										
Pin 1 Brown (BN)	Functional earth	<div>DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). The brown (BN) wire is to be connected to earth. Control The cylinder extends or retracts according to the polarity of the power supply.  <table><tr><th></th><th>Red</th><th>Black</th></tr><tr><td>Retract</td><td>Minus</td><td>Plus</td></tr><tr><td>Extend</td><td>Plus</td><td>Minus</td></tr></table></div>		Red	Black	Retract	Minus	Plus	Extend	Plus	Minus
	Red	Black									
Retract	Minus	Plus									
Extend	Plus	Minus									
Pin 3 Red (RD)	DC supply voltage										
Pin 4 Black (BK)											

Pin assignment M12 Signal (12-pin)

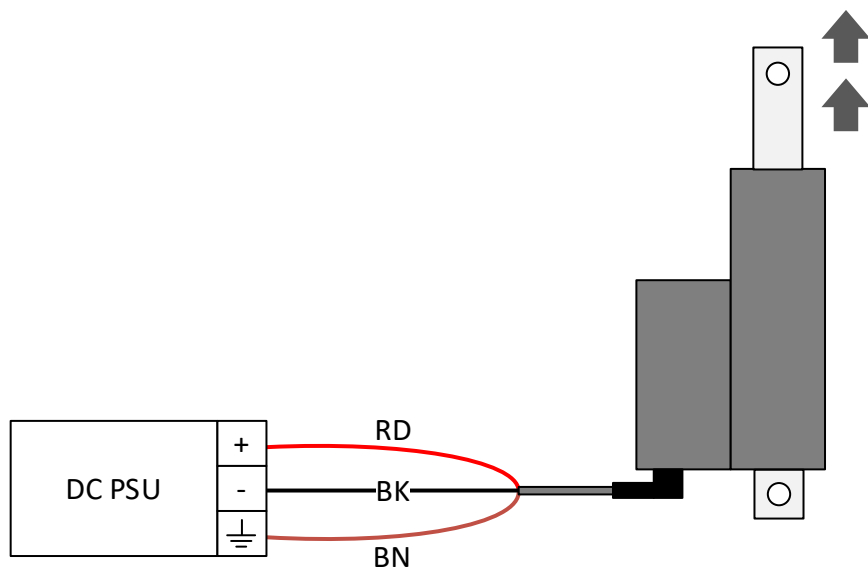
*** Communication & control plug ***

In

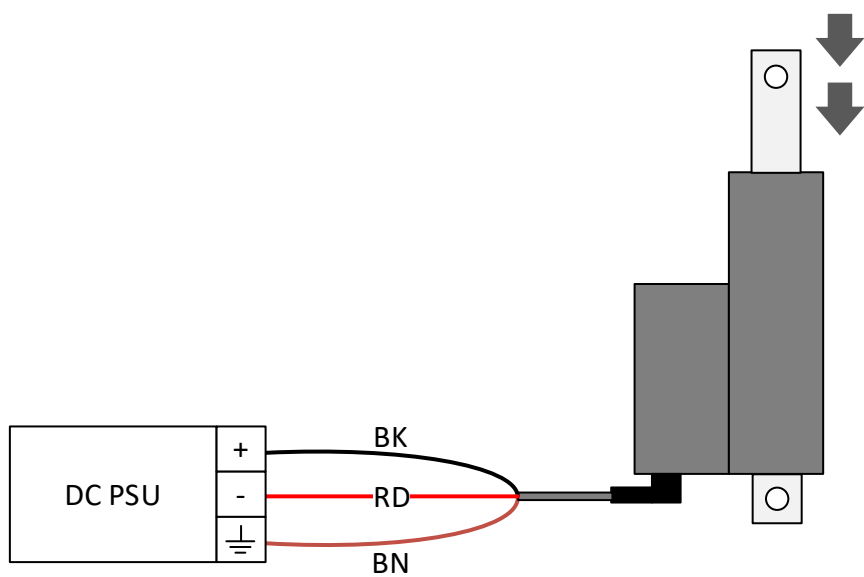
Pin	Description		
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power. Do not connect to the supply voltage!		
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected		
Pin 3 White (WH)	End position contact „Retracted“	End position contact The linear drive has two potential-free, mechanical switches (NO = normal open / normally open). On each end position one switch is closed. The contacts can be used, for example, to control relays, signal lamps, etc. pp. <u>Specification</u> <ul style="list-style-type: none">potential-free switch (NO)U = 0 ... 30VI = 0 ... 100mA Example In the example, two signal lamps are connected to visualize the end positions. The L1 signal lamp lights up when the linear drive is retracted. The L2 signal lamp lights up when the linear drive is extended.	
Pin 4 Green (GN)			
Pin 5 Pink (PK)	End position contact „Extended“	<div><div>BN</div><div>BU</div><div>WH</div><div>GN</div><div>PK</div><div>YE</div><div>BK</div><div>GY</div><div>RD</div></div>	
Pin 6 Yellow (YE)			
Pin 7 Black (BK)	Not connected Leave unconnected		
Pin 8 Grey (GY)			
Pin 9 Red (RD)			
Pin 10 Violet (VT)			
Pin 11 Gray-Pink (GYPK)			
Pin 12 Red-Blue (RDBU)			

Example

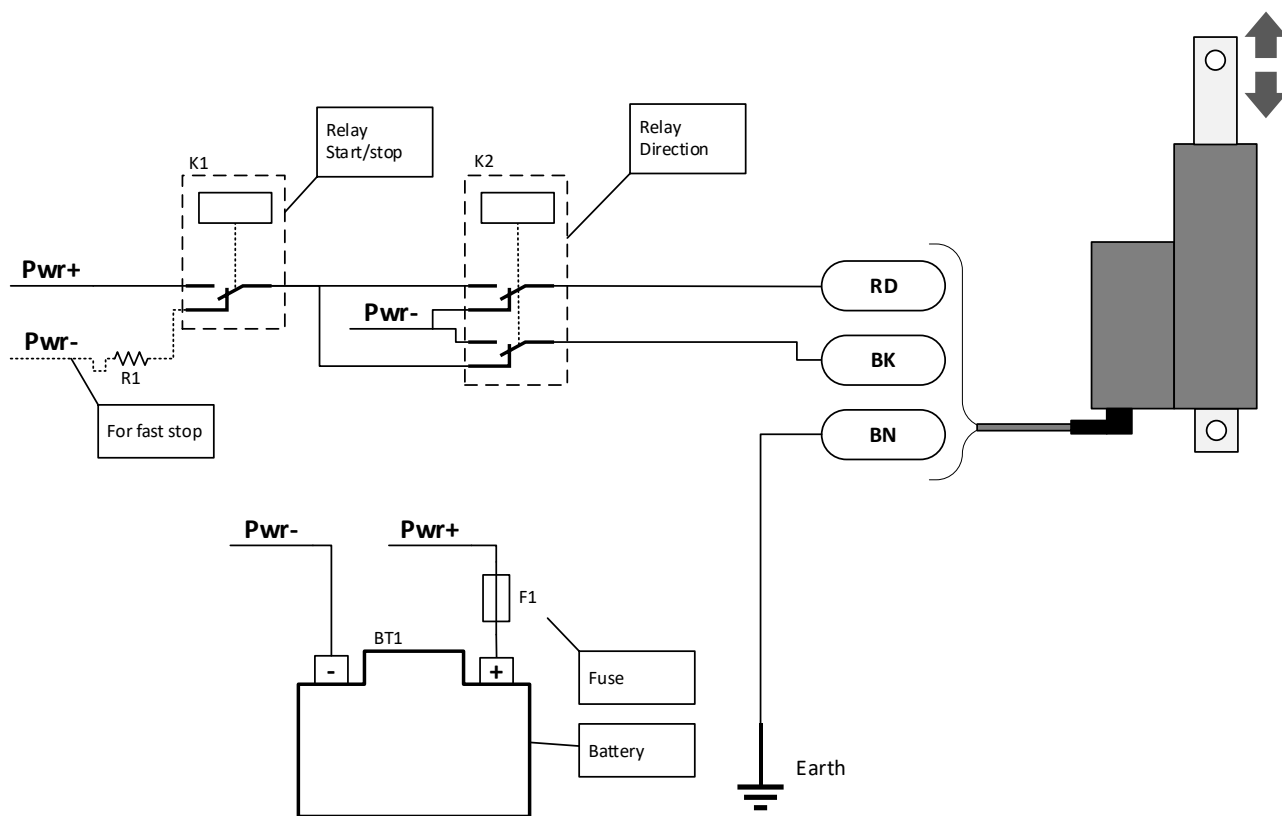
Connection example – Extend



Connection example – Retract



Control example - relay

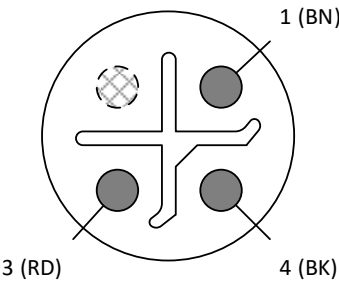


Note: Do not change the direction during the drive. Always stop the motion via relay K1 before changing the direction with K2.

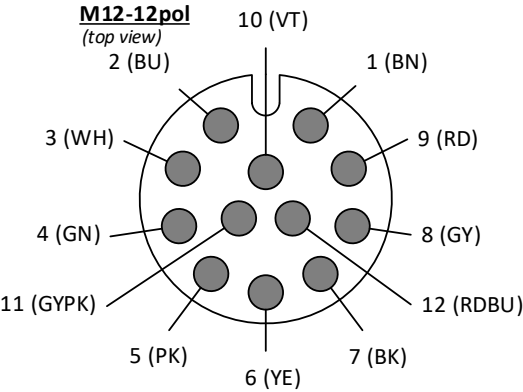
Connection plan AP.4.017809

Cable

M12power
(top view)



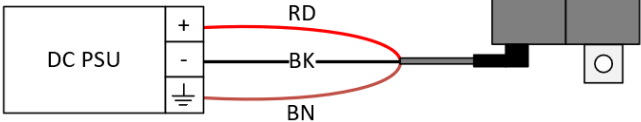
M12-12pol
(top view)



Pin assignment M12power (3-pin)

*** Supply voltage ***

Pwr

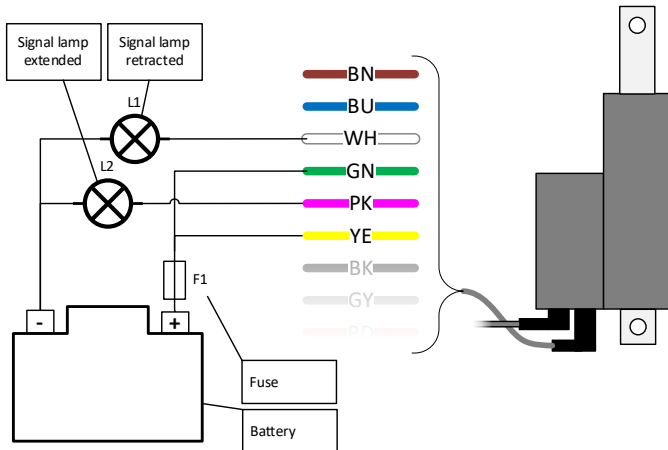
Pin	Description	
Pin 1 Brown (BN)	Functional earth	<p>DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU).</p> <p>Connection Connect the black wire to minus (0V) and the red wire to plus. The permissible voltage can be found on the type plate.</p> <p>The brown (BN) wire is to be connected to earth.</p> 
Pin 3 Red (RD)	DC supply voltage	
Pin 4 Black (BK)		

Pin assignment M12 Signal (12-pin)

*** Communication & control plug ***

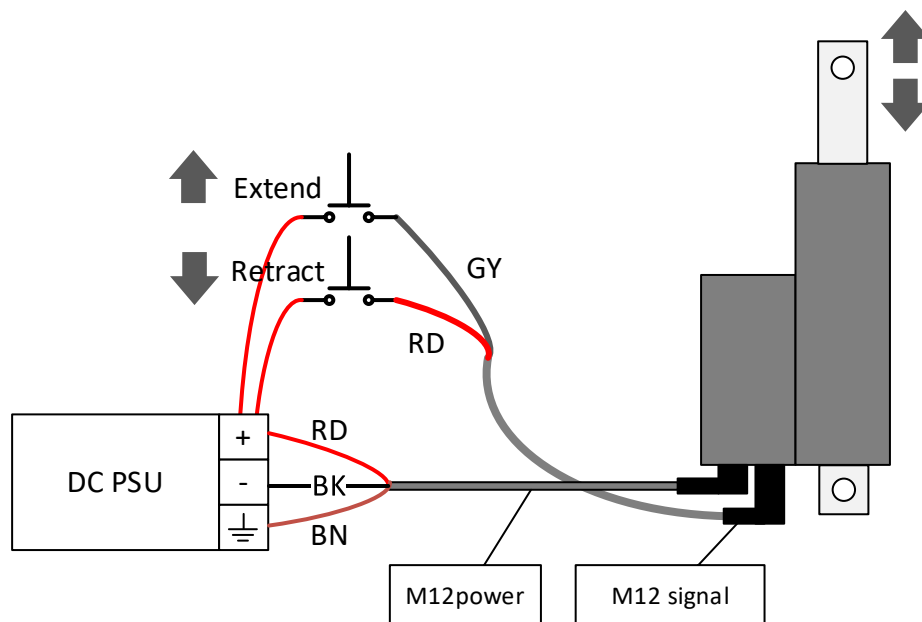
In

Pin	Description
Pin 1 Brown (BN)	<p>GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power.</p> <p>Do not connect to the supply voltage!</p>
Pin 2 Blue (BU)	<p>Not connected – Signal GND Leave unconnected</p>
Continued on next page	

Continued from previous page			
Pin 3 White (WH)	End position contact „Retracted“	End position contact The linear drive has two potential-free, mechanical switches (NO = normal open / normally open). On each end position one switch is closed. The contacts can be used, for example, to control relays, signal lamps, etc. pp. <u>Specification</u> <ul style="list-style-type: none">potential-free switch (NO)U = 0 ... 30VI = 0 ... 100mA Example In the example, two signal lamps are connected to visualize the end positions. The L1 signal lamp lights up when the linear drive is retracted. The L2 signal lamp lights up when the linear drive is extended.	
Pin 4 Green (GN)			
Pin 5 Pink (PK)	End position contact „Extended“		
Pin 6 Yellow (YE)			
Pin 7 Black (BK)	Not connected Leave unconnected		
Pin 8 Grey (GY)	Control You can retract and extend the cylinder via the two wires. By applying a voltage, for example the supply voltage of the cylinder, to the red wire (pin 9), the cylinder retracts. The definition of the wires is as follows: <ul style="list-style-type: none">Pin 8 (GY): ExtendPin 9 (RD): Retract		
Pin 9 Red (RD)	Voltage level <ul style="list-style-type: none">Drive: 8.0 ... 30.0 VDC*Stop: 0.0 ... 0.8 VDC* *with respect to GND (pin 1)		
Pin 10 Violet (VT)	Not connected Leave unconnected		
Pin 11 Gray-Pink (GYPK)			
Pin 12 Red-Blue (RDBU)			

Example

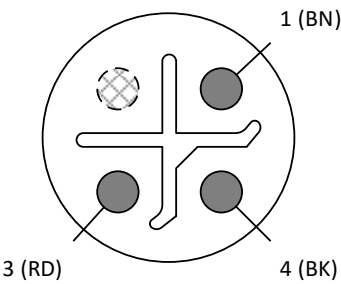
Connection example – drive



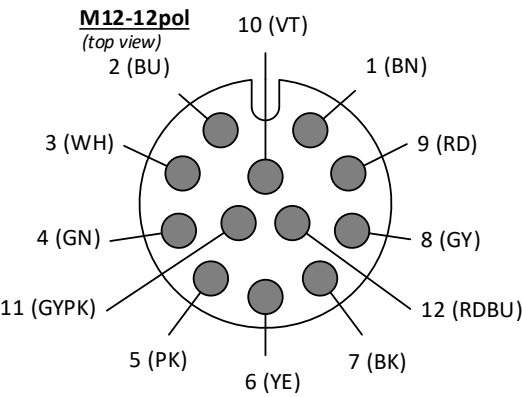
Connection plan AP.4.017810

Cable

M12power
(top view)



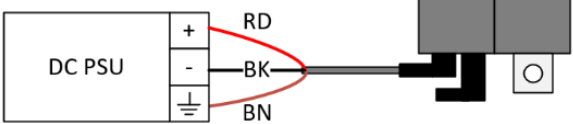
M12-12pol
(top view)



Pin assignment M12power (3-pin)

*** **Supply voltage** ***

Pwr

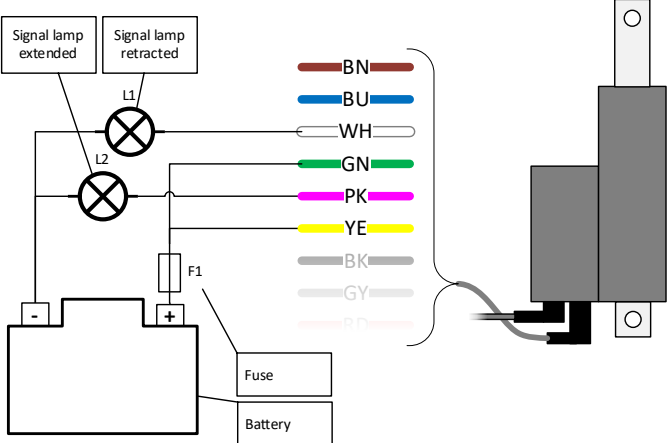
Pin	Description	
Pin 1 Brown (BN)	Functional earth	DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). Connection Connect the black wire to minus (0V) and the red wire to plus. The permissible voltage can be found on the type plate. The brown (BN) wire is to be connected to earth. 
Pin 3 Red (RD)	DC supply voltage	
Pin 4 Black (BK)		

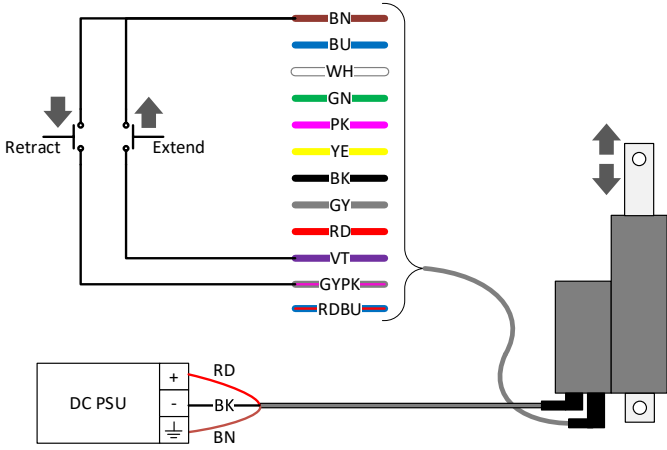
Pin assignment M12 Signal (12-pin)

*** **Communication & control plug** ***

In

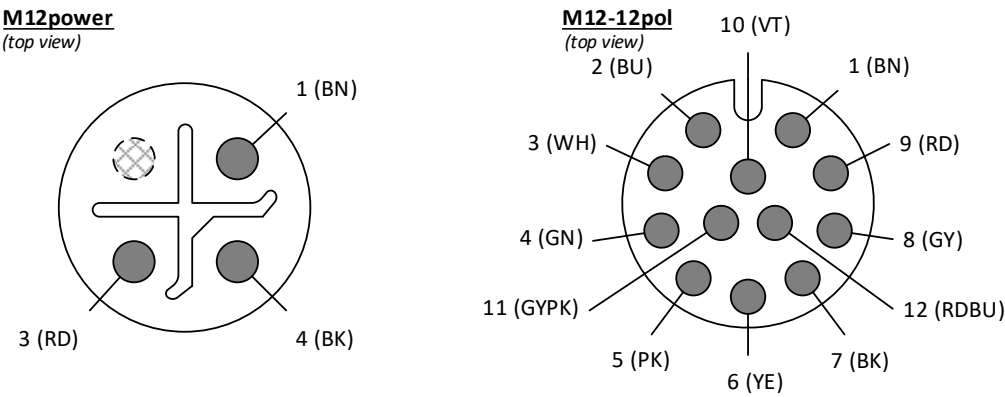
Pin	Description
Pin 1 Brown (BN)	GND of the linear drive Low-resistance GND connection of the linear drive. Use this wire to extend and retract the linear drive. This is also described at pin 10 and 11. Do not connect to the supply voltage!
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected
Continued on next page	

Continued from previous page		
Pin 3 White (WH)	End position contact „Retracted“	End position contact The linear drive has two potential-free, mechanical switches (NO = normal open / normally open). On each end position one switch is closed. The contacts can be used, for example, to control relays, signal lamps, etc. pp. <u>Specification</u> <ul style="list-style-type: none">• potential-free switch (NO)• U = 0 ... 30V• I = 0 ... 100mA Example In the example, two signal lamps are connected to visualize the end positions. The L1 signal lamp lights up when the linear drive is retracted. The L2 signal lamp lights up when the linear drive is extended.
Pin 4 Green (GN)		
Pin 5 Pink (PK)	End position contact „Extended“	
Pin 6 Yellow (YE)		
Pin 7 Black (BK)	Not connected Leave unconnected	
Pin 8 Grey (GY)		
Pin 9 Red (RD)		
Continued on next page		

Continued from previous page		
Pin 10 Violet (VT)	Extend	Control Connect the violet wire (VT) to the brown wire (BN) to extend the linear drive. Connect the gray-pink wire (GYPK) to brown (BN) to retract the linear drive. It stops automatically in the end position.
Pin 11 Gray-Pink (GYPK)	Retract	<div> Specification <ul style="list-style-type: none"> Connected: $\leq 10\ \Omega$ Not connected: $\geq 100k\ \Omega$ </div> <div>  </div>
Pin 12 Red-Blue (RDBU)	Not connected Leave unconnected	

Connection plan AP.4.017902

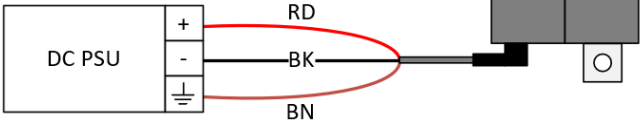
Pin assignment



Pin assignment M12power (3-pin)

*** Supply voltage ***

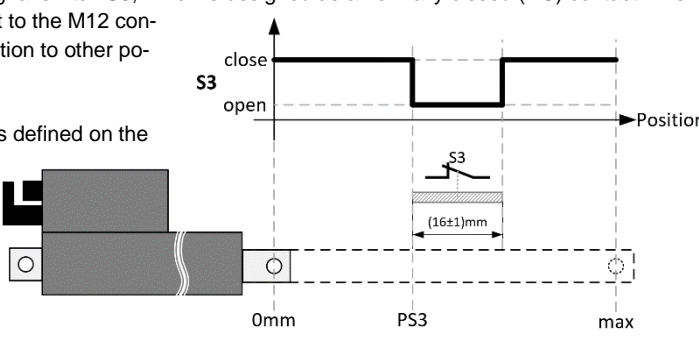
Pwr

Pin	Description	
Pin 1 Brown (BN)	Functional earth	DC supply voltage The power cable is used to supply the cylinder with power from the DC supply voltage (DC PSU). Connection Connect the black wire to minus (0V) and the red wire to plus. The permissible voltage can be found on the type plate. The brown (BN) wire is to be connected to earth. 
Pin 3 Red (RD)		
Pin 4 Black (BK)		

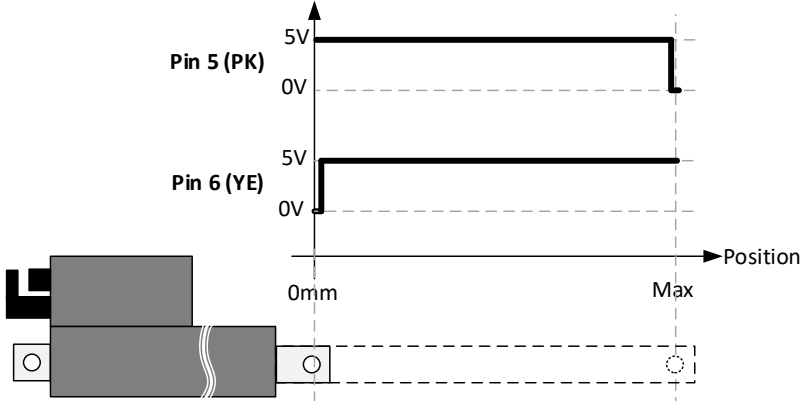
Pin assignment M12 Signal (12-pin)
*** Communication & control plug ***

In

Pin	Description
Pin 1 Brown (BN)	GND Low-resistance GND connection of the cylinder. Depending on the current, the GND potential is approx. 0.2 to 0.6V higher than the negative potential at the M12power connector. Only use this pin if you want to connect an interface that is galvanically isolated from M12power. Do not connect to the supply voltage!
Pin 2 Blue (BU)	Not connected – Signal GND Leave unconnected
Pin 3 White (WH)	Potential free switch at a middle position The linear drive contains a central signal switch S3, which is designed as a normally closed (NC) contact. The two contacts of the switch are led out to the M12 connector and have no electrical connection to other potentials within the linear drive. The position PS3 of the pushbutton is defined on the specification drawing of the linear drive. The switch is triggered when the linear drive is at a standstill or in motion. It is independent of the electrical supply to the linear drive. Specification <ul style="list-style-type: none">potential-free switch (NO)U = 0 ... 30VI = 0 ... 100mA
Pin 4 Green (GN)	

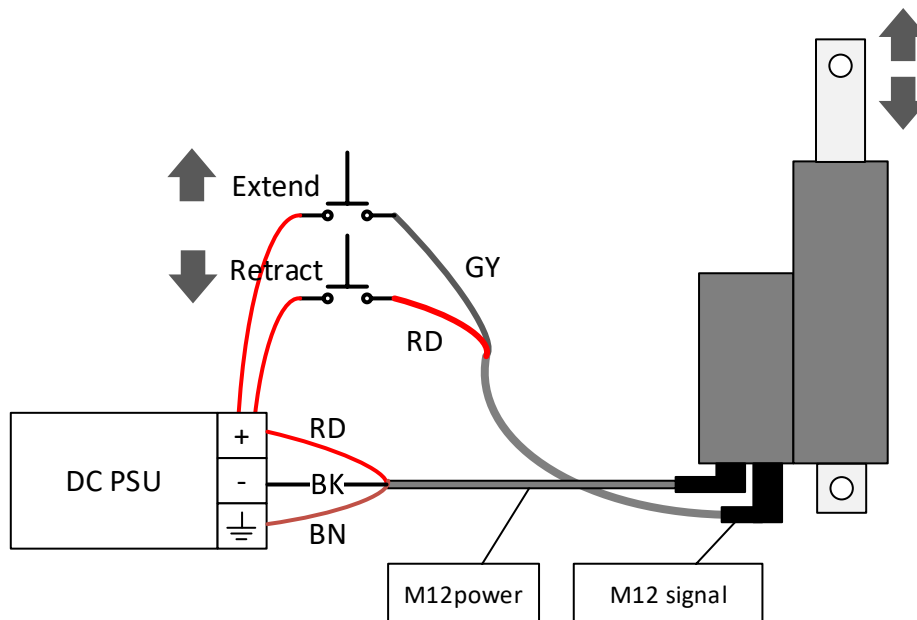


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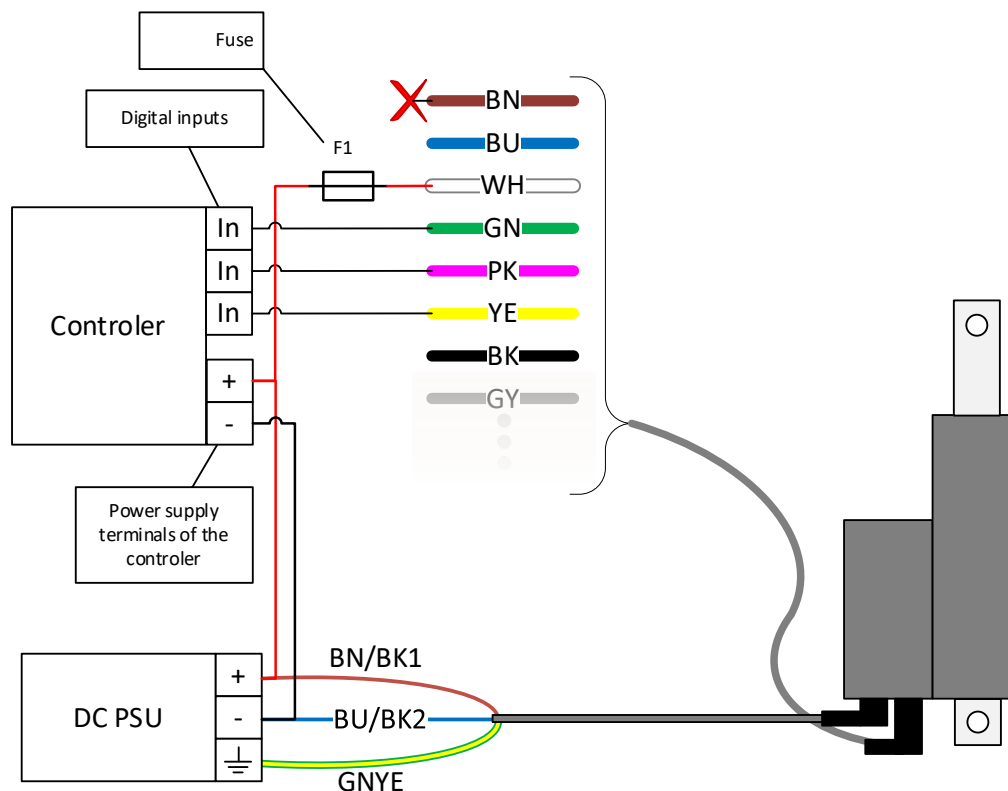
Continued from previous page		
Pin 5 Pink (PK)	End position signal Extended	End position signal The cylinder indicates when the retracted and extended end positions are reached with a separate pin each via a 5V signal. This enables your control system to determine the end position of the cylinder without the need for external sensors.
Pin 6 Yellow (YE)	End position signal Retracted	Level definitions* <ul style="list-style-type: none">End position reached: approx. 0.0VAny middle position: approx. 5.0V Interface specification* <ul style="list-style-type: none">Load R_L $\geq 10k\ \Omega$High level <small>without any load</small> 4.8 ... 5.2 VHigh level <small>with R_L</small> $\geq 4.0\ V$Low level $\leq 0.2\ V$ <div><p>*with respect to GND (pin 1)</p></div>
Pin 7 Black (BK)	Not connected Leave unconnected	
Pin 8 Grey (GY)	Control You can retract and extend the cylinder via the two wires. By applying a voltage, for example the supply voltage of the cylinder, to the red wire (pin 9), the cylinder retracts. The definition of the wires is as follows: <ul style="list-style-type: none">Pin 8 (GY): ExtendPin 9 (RD): Retract Voltage level <ul style="list-style-type: none">Drive: 8.0 ... 30.0 VDC*Stop: 0.0 ... 0.8 VDC* <p>*with respect to GND (pin 1)</p>	
Pin 9 Red (RD)		
Pin 10 Violet (VT)	Not connected Leave unconnected	
Pin 11 Gray-Pink (GYPK)		
Pin 12 Red-Blue (RDBU)		

Example

Connection example – drive



Connection example – Feedback signal



Note: The figure shows a common application in which the control unit is connected to a central GND (minus), such as the cylinder. The brown wire (GND) of the 12-pole cable must not be connected in this constellation.